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PC WORLD

NOVEMBER 1992 $3.95

20 Best Upgrades

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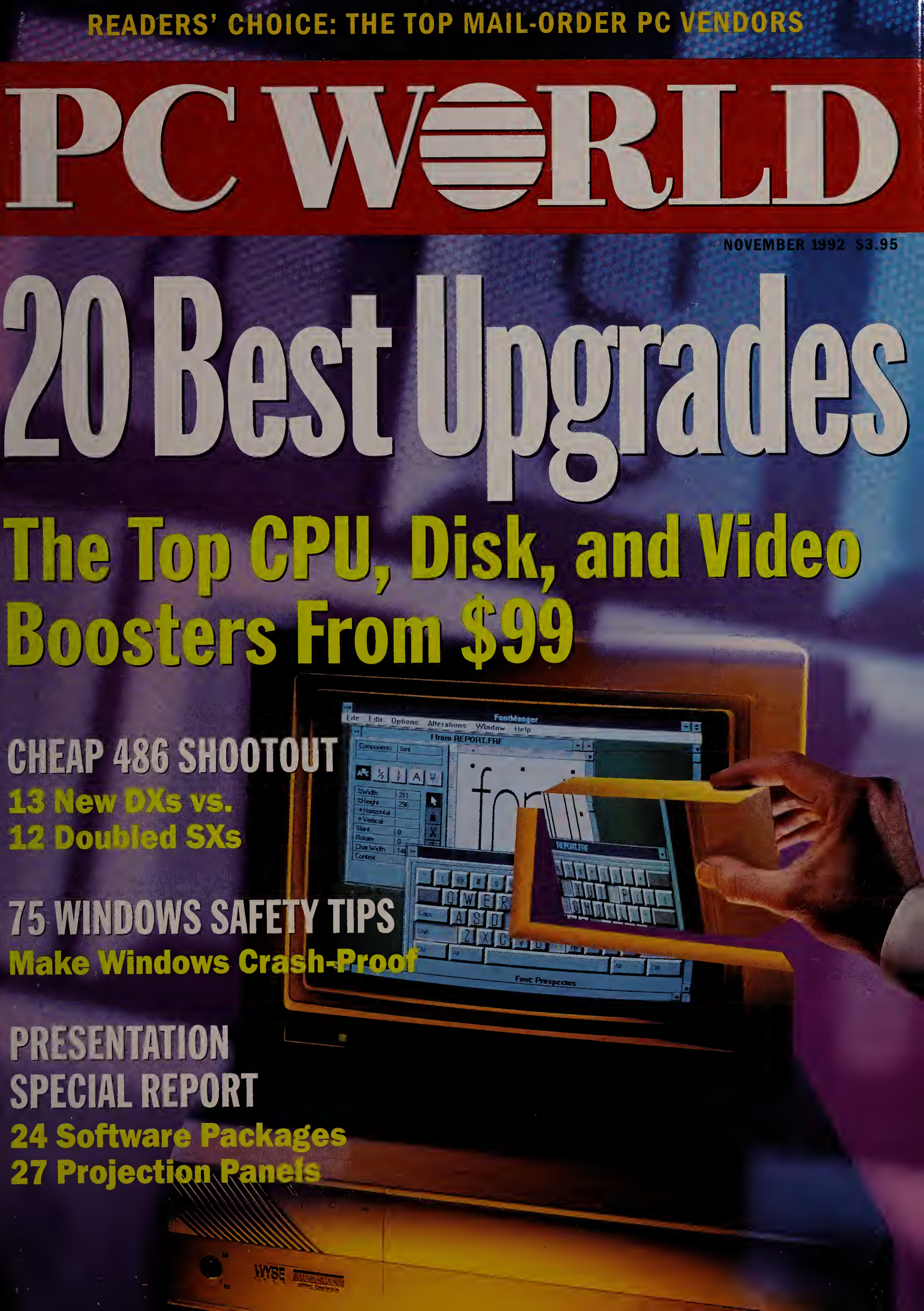

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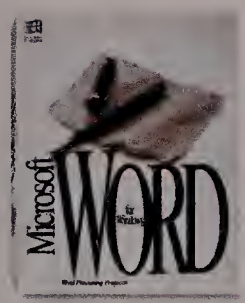
After all, they helpe



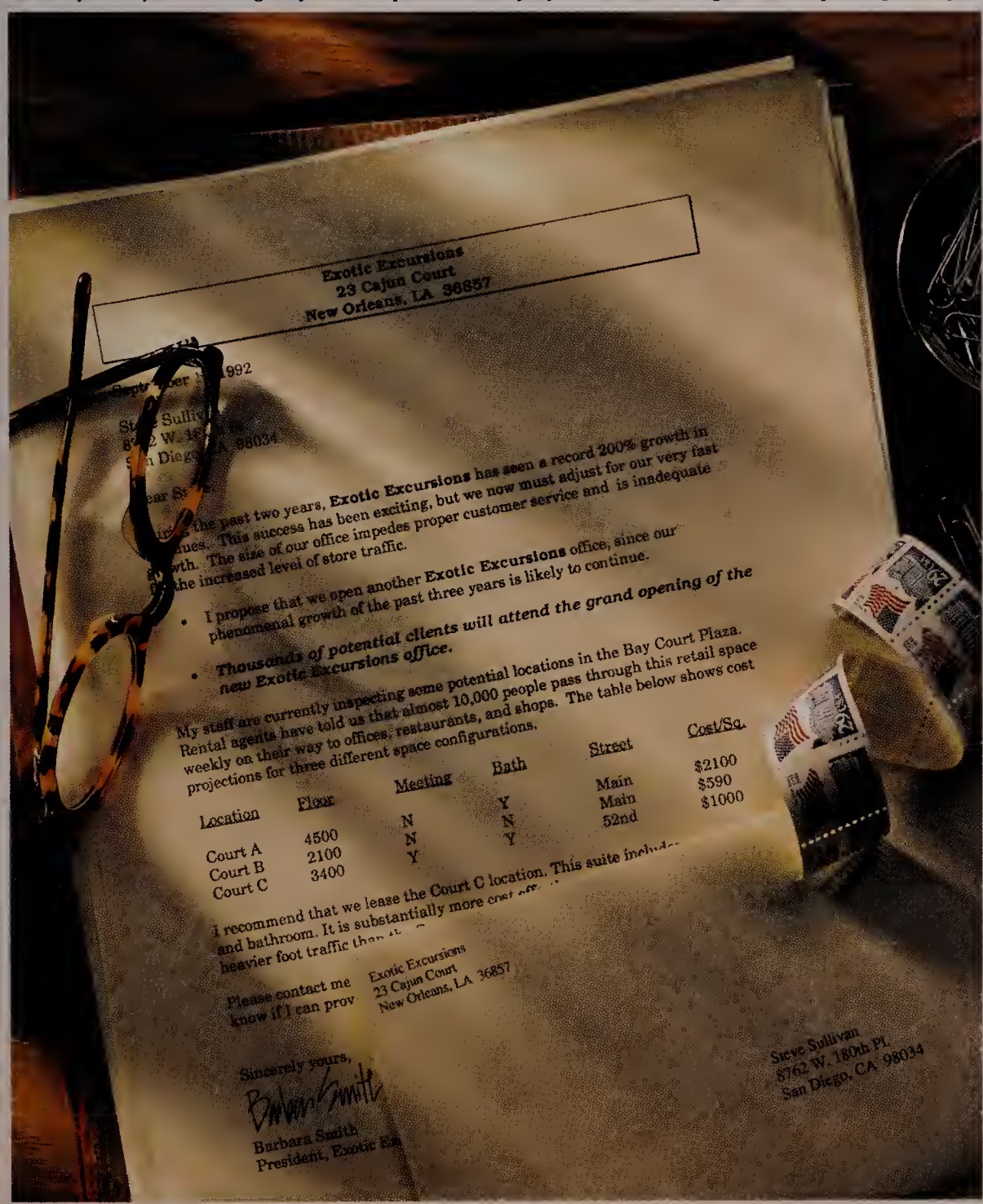
At last count, more than half a million WordPerfect® for DOS users have switched to Microsoft® Word version 2.0 for Windows.™ And there are plenty of good reasons why.

First of all, WordPerfect for DOS users helped us create Word for Windows, and actually made it easier.

Every week during the development of Word for Windows, we invited WordPerfect users to try it out on the things they do every day at work, like letters, memos, and even big reports. We call these types of sessions "usability studies."

It's an important part of the process we go through in developing all our software. Because "usability studies" help us find out the way in which people use their computers, and how we can make it easier.

Microsoft Word for Windows gives you one-step access to everyday tasks, like inserting bullets and printing envelopes.



In this case, we were able to design a number of innovative and time-saving features into Word for Windows that can make not only the things you do every day easier, but also the transition from WordPerfect.

For example, it reads WordPerfect files. Better yet, just type in your familiar WordPerfect commands and Word for Windows shows you the equivalent commands. So you can learn as you work.

We've also added a customizable Toolbar that gives you one-step access

This three-dimensional bar chart, which was created in Word for Windows, shows the approximate total numbers of WordPerfect for DOS users who have switched to Microsoft Word for Windows each year. For more information in Canada, call (206) 936-8661. Customers in Canada, call (800) 563-9048. © 1992 Microsoft Corporation. All rights reserved. Printed in the United States. Microsoft is a registered trademark and Windows is a tr

d define it.

to everyday tasks. And other innovative features, like drag-and-drop movement of text or graphics that lets you easily rearrange your page layout any way you want.

Then, to be sure that all of these features worked for WordPerfect users, we had them put to the test in the real world, with the help of the folks at the National Software Testing Labs.

From November 1989 to August 1992, over half a million WordPerfect users have switched to Microsoft Word for Windows.

After conducting in-depth tests in 10 cities, from Los Angeles to New York, the National Software Testing Labs discovered that for ease-of-use, nearly 8 out of 10 WordPerfect users chose Microsoft Word for Windows over WordPerfect for Windows.

But WordPerfect users aren't the only ones who prefer Microsoft Word for Windows. This year, it was awarded "Best Buy" by *PC World*. And the "Editors' Choice" by *PC Magazine*.

For more information on how to make the switch to the leading word processor for Windows, call us at (800) 426-9400, Department HY9. And discover why, for over half a million people, Word for Windows has become the latest chapter in the development of word processing.

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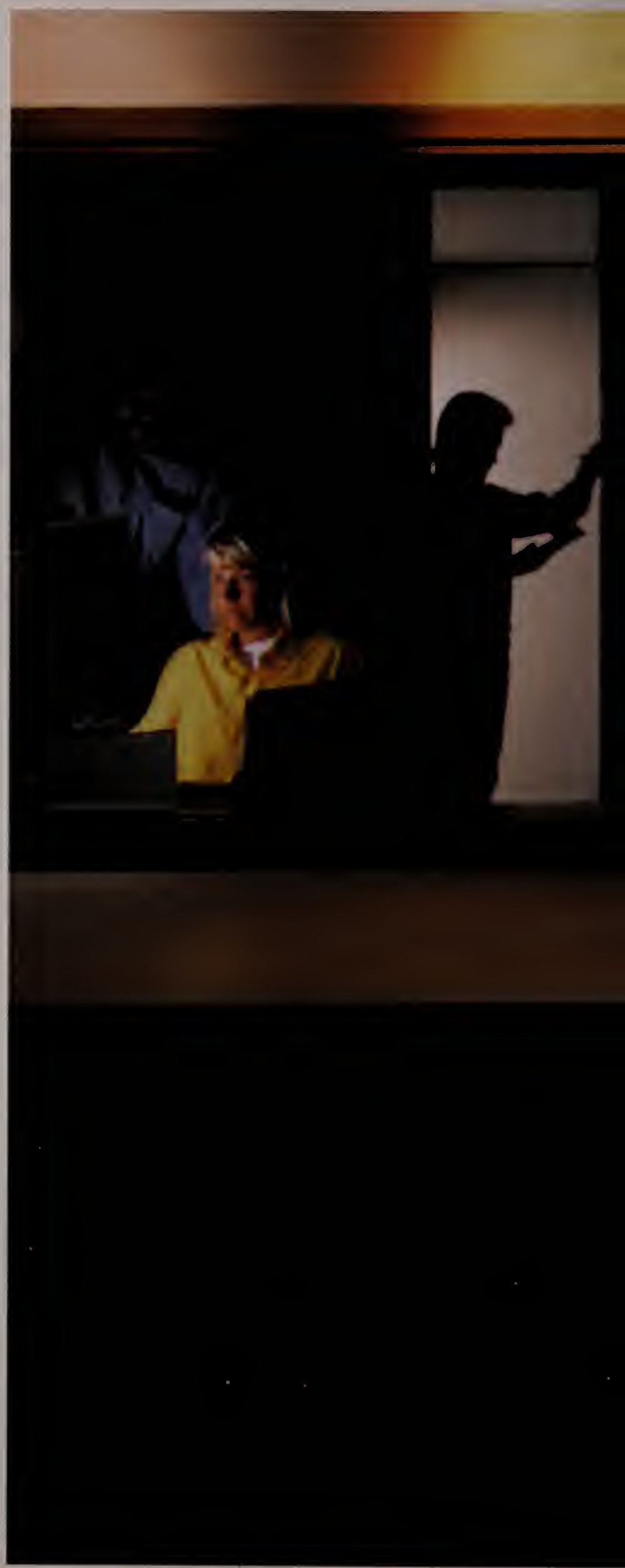
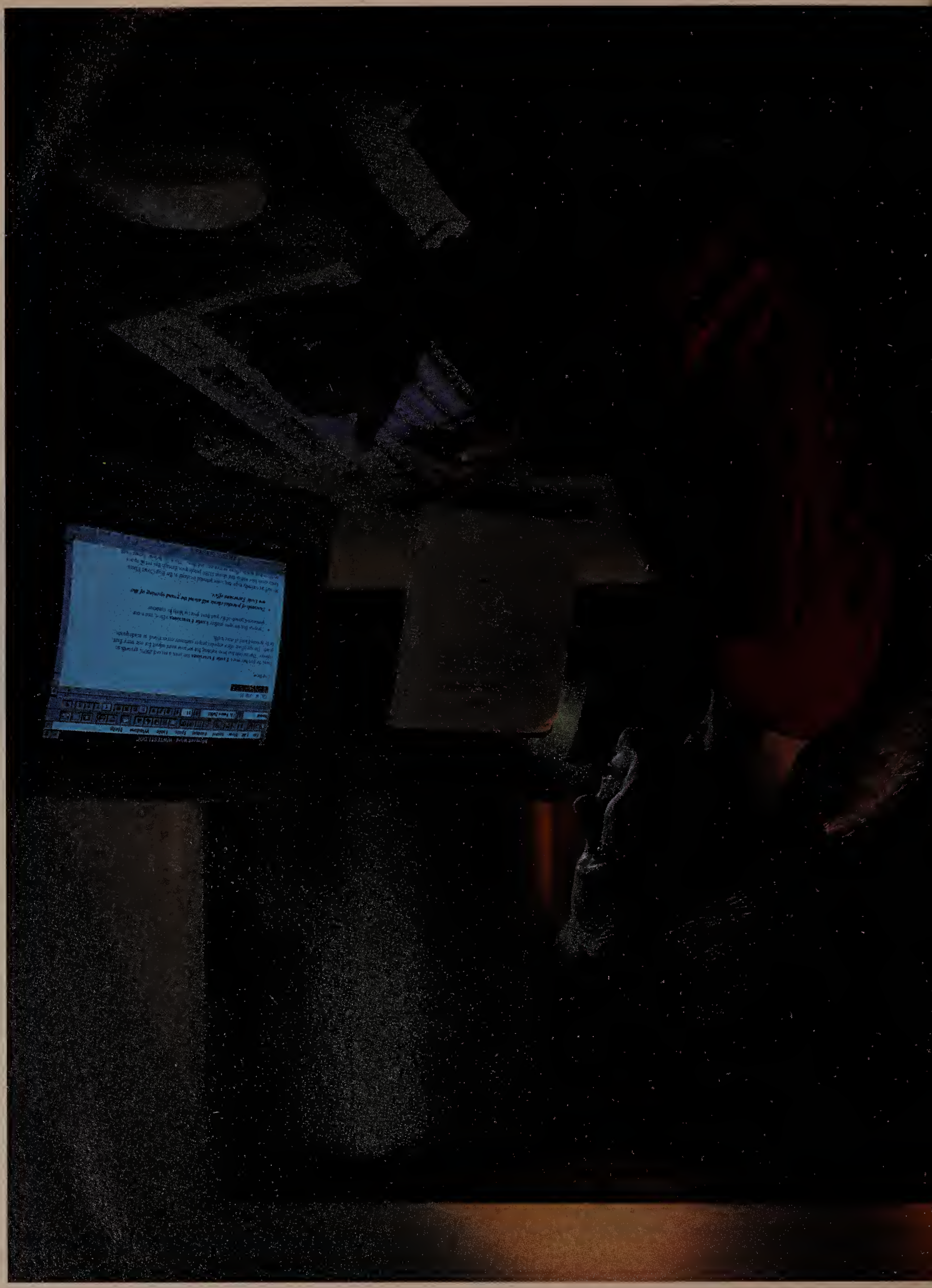


It's not surprising that WordPerfect users are switching to Microsoft Word for Windows.



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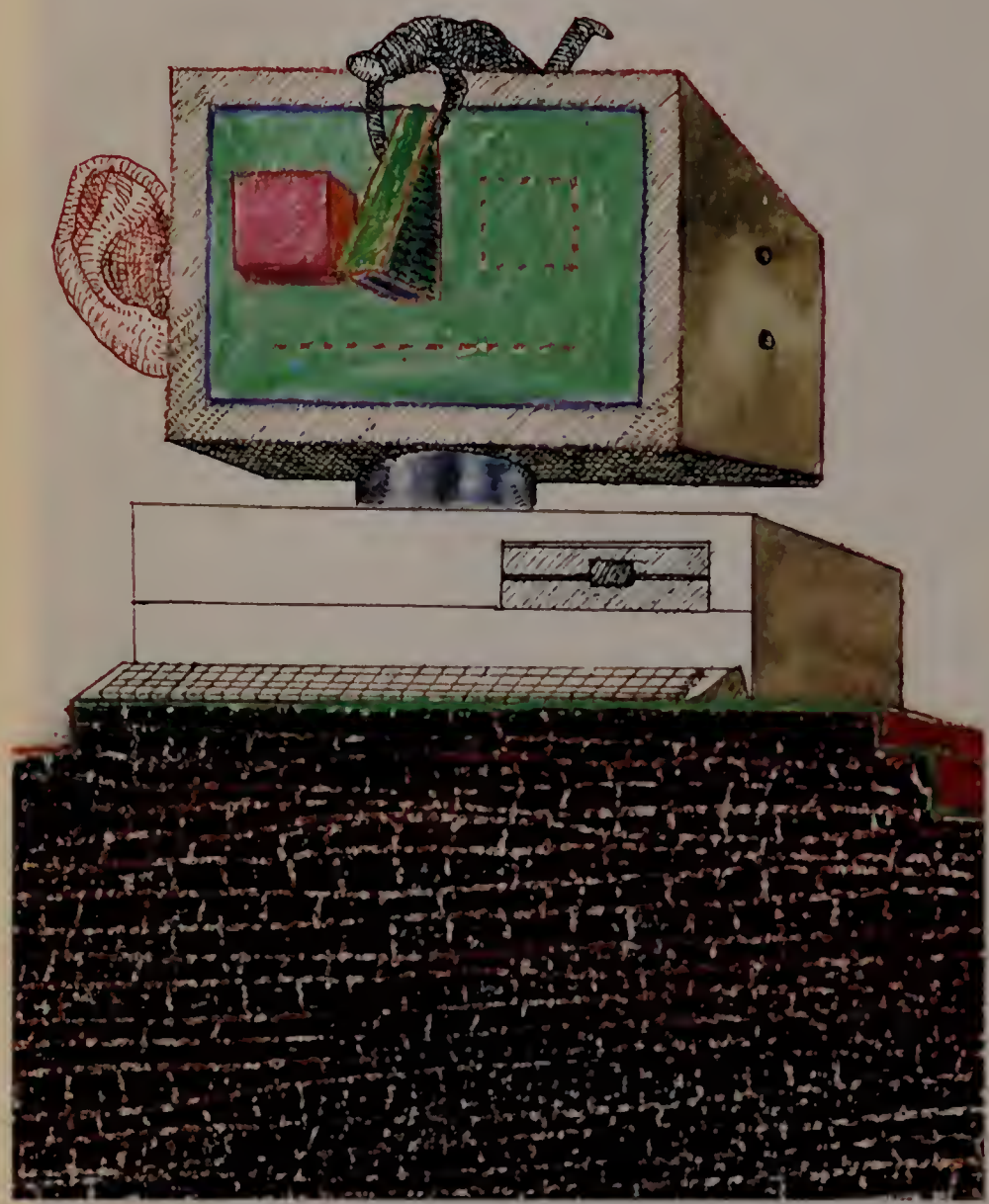

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158 Best Choice: 486DXs or Upgraded 486SXs?
Is a full-fledged 486DX a better deal than a clock-doubled 486SX? Or does it make more sense to buy a cheaper system now and boost performance later? To find out, we tested 25 systems with top price/performance: 25-MHz 486SXs upgraded with OverDrive chips, and full-fledged 486DX-33s.

197 Readers Rate Direct-Sale Vendors
Just how reliable are mail-order PCs? We asked, and more than 4000 of you told us. Find out how the largest direct-sale vendors rate when it comes to hardware reliability, service, and technical support.

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20 Top Upgrades

110/ Tired of your old workhorse but too short on cash to buy a fast new PC? Upgrades can solve the dilemma. For a fraction of the cost of a new system, 20 low-cost enhancements—from caching controllers and accelerator boards to dirt-cheap RAM—can jump-start performance and deliver huge productivity gains.

Cover photograph by Robert Cardin
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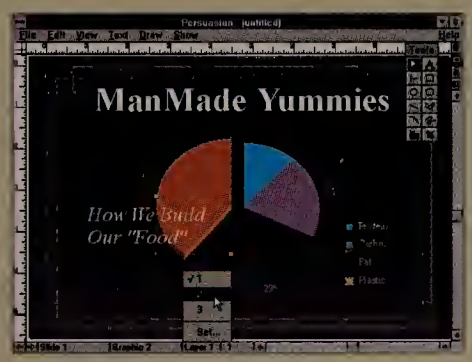

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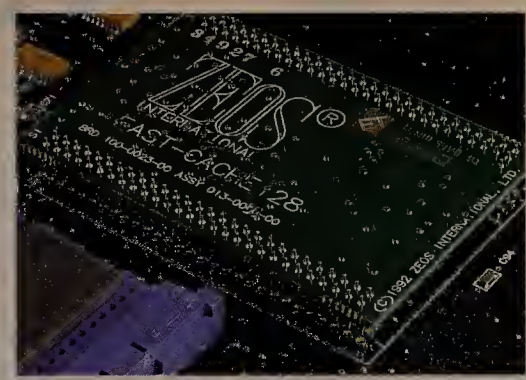

You can upgrade your system now or in the future with our optional 128K or 256K secondary cache modules.

New ZEOS® PCs!

cache. Plus other ZEOS performance options. Like your upgradable high-speed cache!

You simply get more. For less. When everyone else is cutting prices by giving less, ZEOS had a better idea—Use the very latest technology to design an entirely new line of high-performance upgradables that allow us to *charge less while giving more.* You're going to love it!

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While the others are talking about local bus, often creating their own non-standard solutions, ZEOS gives you a VESA future. As a working member of the VESA Standards Committee, ZEOS has incorporated *two* slots conforming to the recently established VESA standard.

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Because painfully missing from many competitors' offerings is the option for a secondary cache. With ZEOS you can add a secondary cache of 128K or 256K. This speeds up many memory-intensive applications. Take it now or add it later. ZEOS gives you the option.

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Because your new ZEOS upgradable offers you the additional option of on-board SCSI. By simply adding a single socketed SCSI chip to the board, your new ZEOS system supports both SCSI I and SCSI II-type devices. You can now have SCSI hard drives (running *in addition* to your standard IDE drives) plus tape backups, optical drives and a host of other SCSI peripherals. Take it now or add it later. Only from ZEOS.

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And don't forget, when you purchase any new ZEOS Windows-based system, you will also receive your choice of two: *Lotus 1-2-3 for Windows, Ami Pro,* and *Freelance Graphics*. The software alone carries a suggested retail price of over $1,000 and we're giving it to you absolutely free. Now that's ZEOS Value.

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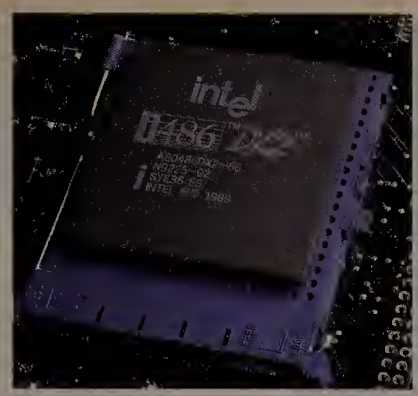
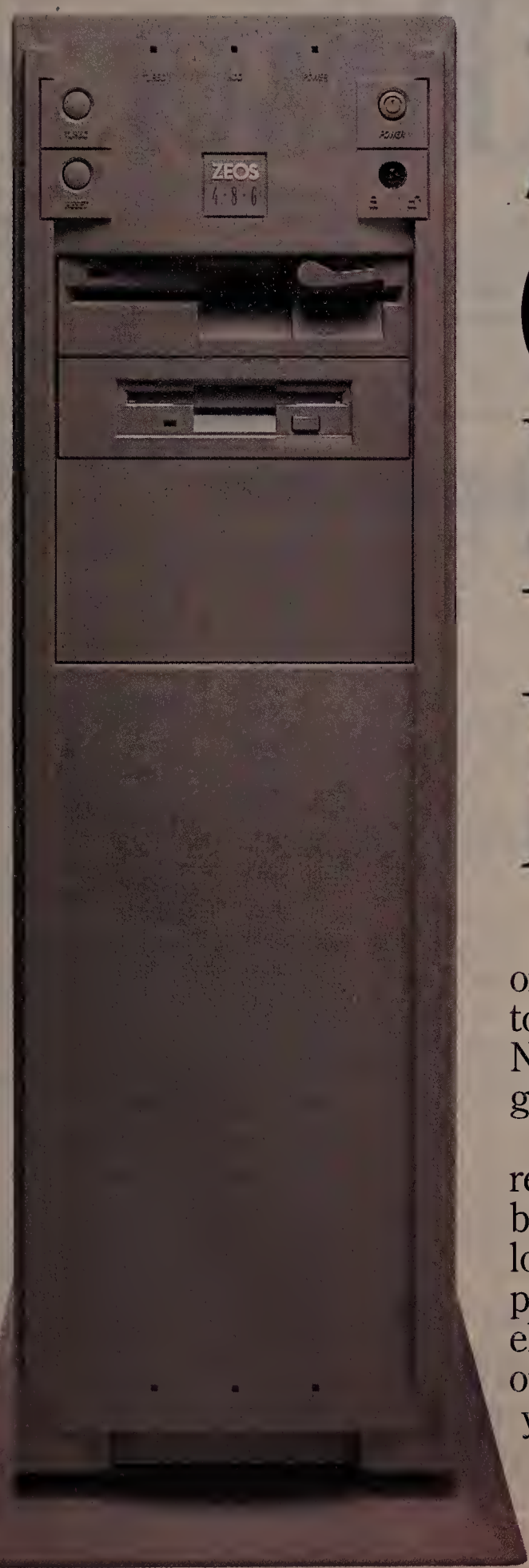
Ordering your new ZEOS upgradable system is easy. Simply pick up the phone and give us a call. A friendly and knowledgeable ZEOS Systems Consultant is ready to answer any questions you may have. You're going to love your new ZEOS system. *Why not give us a call right now!*



Pick your power! 486SX-25 thru the 486DX2-66. And upgrading is easy with our Zero Insertion Force (ZIF) socket. Note the extra row of pins for the future OverDrive™ processor based on Intel's P5 technology.

When you buy any ZEOS Windows system you can choose 2 of 3 Windows applications: Lotus 1-2-3 for Windows, Ami Pro and Freelance Graphics for Windows!



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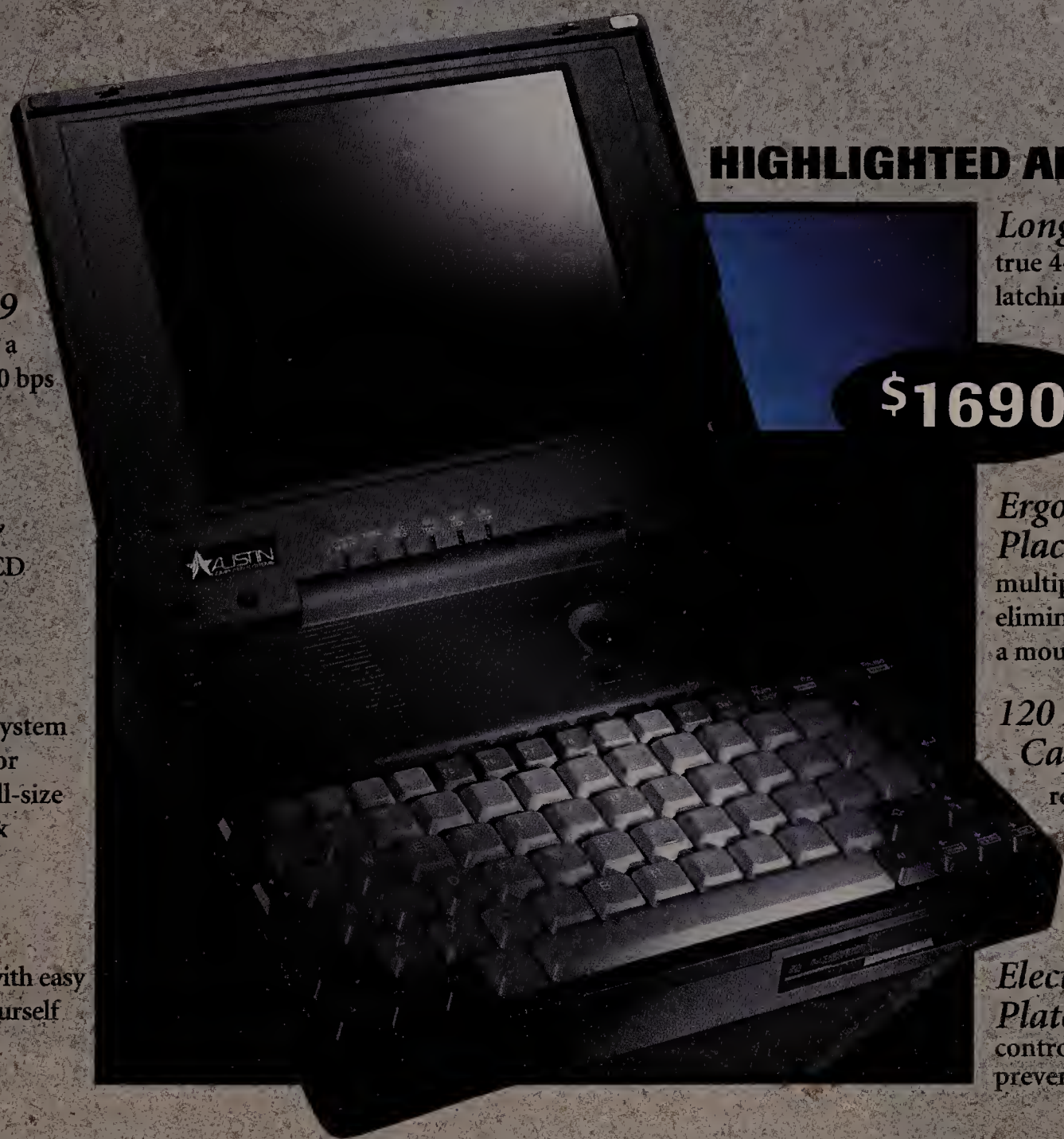

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PCW-AD-1

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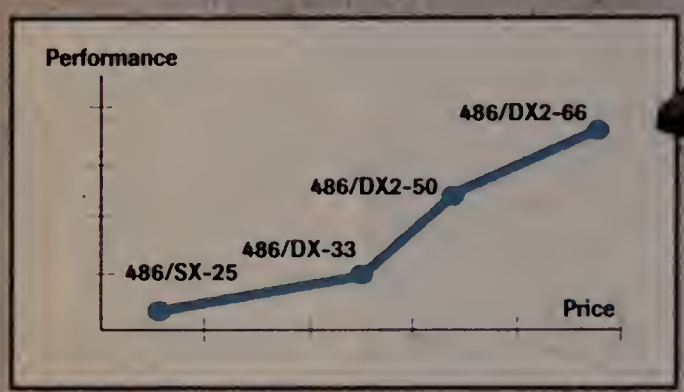

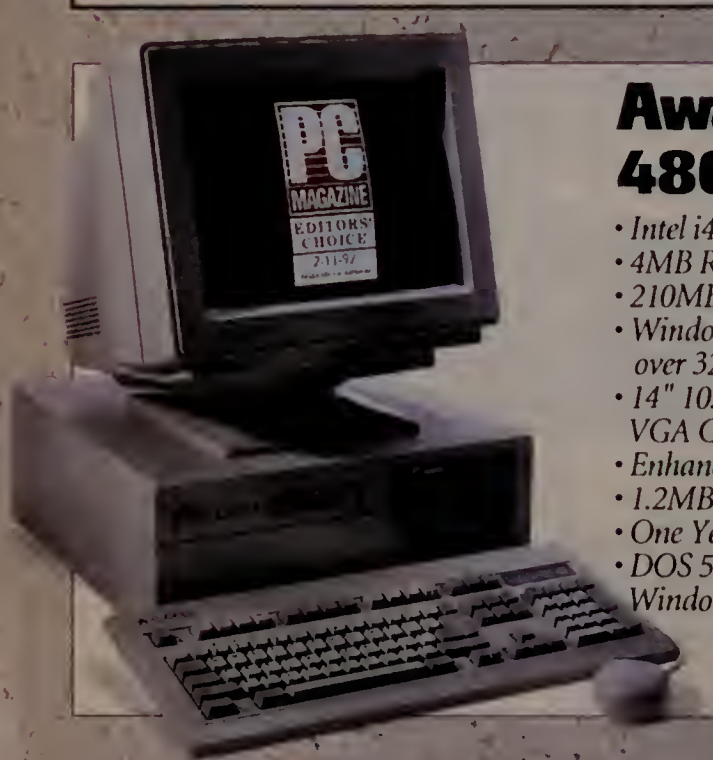

Award-Winning 486/33 WinStation

- *Intel i486 Processor running at 33MHz*
- *4MB RAM, 64K RAM Cache*
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PC MAGAZINE EDITORS' CHOICE
February 11, 1992
Austin 486-33i WinStation

"Most bang for the buck!"

"The Austin 486/33i WinStation packs a lot of performance and expansion into a compact package. It is attractive, aggressive and affordable."

PC Magazine Contributing Editor Winn L. Rosch

A U S

PCW-AD-2

486/SLC-33 WinStation	386/33 WinStation	486/DLC-40 WinStation	486/33 WinStation	486/DX2-50 WinStation
Cyrix 486SLC, running at 33MHz	Intel i386, 33MHz w/64K Cache	Cyrix 486DLC, 40MHz w/64K Cache	Intel i486, 33MHz w/128K Cache	Intel i486DX2, 50MHz w/128K Cache
2MB RAM (to 32MB)	4MB RAM (to 32MB)	4MB RAM (to 32MB)	4MB RAM (to 32MB)	4MB RAM (to 32MB)
40MB Hard Drive	80MB Hard Drive	120MB Hard Drive	210MB Hard Drive	210MB Hard Drive
14" VGA 640x480 Color Monitor w/256K Video RAM	14" VGA 640x480 Color Monitor w/256K Video RAM	14" VGA 640x480 Color Monitor w/256K Video RAM	14" VGA 1024x768 Non-Interlaced Color Monitor w/Windows Accelerator	14" VGA 1024x768 Non-Interlaced Color Monitor w/Windows Accelerator
1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives
101-Key Keyboard	101-Key Keyboard	101-Key Keyboard	101-Key Keyboard	101-Key Keyboard
DOS 5.0/Windows 3.1/ Mouse	DOS 5.0/Windows 3.1/ Mouse	DOS 5.0/Windows 3.1/ Mouse	DOS 5.0/Windows 3.1/ Mouse	DOS 5.0/Windows 3.1/ Mouse
Small Footprint Chassis	Small Footprint Chassis	Small Footprint Chassis	Small Footprint Chassis	Small Footprint Chassis
$1290	$1390	$1590	$2190	$2390

486/50 WinStation	486/DX2-66 WinStation	486/DX2-50 EISA WinStation	486/DX2-66 EISA WinTower	386/SX25 Notebook
Intel i486 running at 50MHz w/128K Cache	Intel i486DX2 running at 66MHz w/128K Cache	Intel i486DX2 running at 50MHz w/128K Cache	Intel i486DX2 running at 66MHz w/128K Cache	386SX running at 25MHz 4MB RAM (to 8MB)
4MB RAM (to 32MB)	4MB RAM (to 32MB)	8MB RAM (to 32MB)	8MB RAM (to 32MB)	60MB Hard Drive
210MB Hard Drive	210MB Hard Drive	210MB Hard Drive	330MB HD, EISA/SCSI Cont.	9.4" VGA LCD Display, 640x480 w/ 32 gray scale
14" VGA 1024x768 Non-Interlaced Color Monitor w/Windows Accelerator	14" VGA 1024x768 Non-Interlaced Color Monitor w/Windows Accelerator	14" VGA 1024x768 Non-Interlaced Color Monitor w/Windows Accelerator	14" VGA 1024x768 Non-Interlaced Color Monitor w/Windows Accelerator	1.44MB Floppy Drive Send/Receive Fax Modem
1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives	1.44MB & 1.2MB Floppy Drives	Built-In Track Ball 79-Key Keyboard
101-Key Keyboard	101-Key Keyboard	101-Key Keyboard	101-Key Keyboard	DOS 5.0, Windows 3.1, PFS Window Works, and Contact Manager
DOS 5.0/Windows 3.1/ Mouse	DOS 5.0/Windows 3.1/ Mouse	DOS 5.0/Windows 3.1/ Mouse	DOS 5.0/Windows 3.1/ Mouse	
Small Footprint Chassis	Small Footprint Chassis	Small Footprint Chassis	Tower Chassis	6.2 lbs. with battery
$2490	$2790	$2890	$3990	$1990

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T I N

PCW-AD-3

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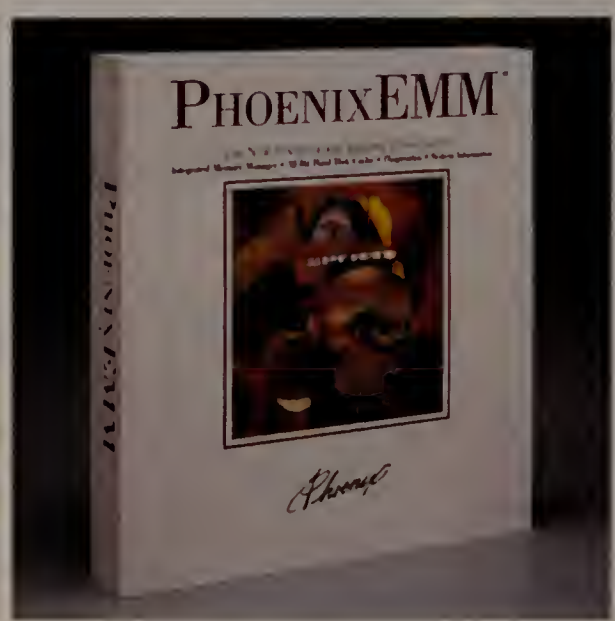

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A robust and feature rich memory manager with automatic memory allocation, optimization, and control. Full EMS, XMS, HMA, and UMB management. Plus, UMBPro for 286 memory management. More memory. Higher performance. Full Compatibility.

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Circle 170 on reader service card

Welcome to the New PC World

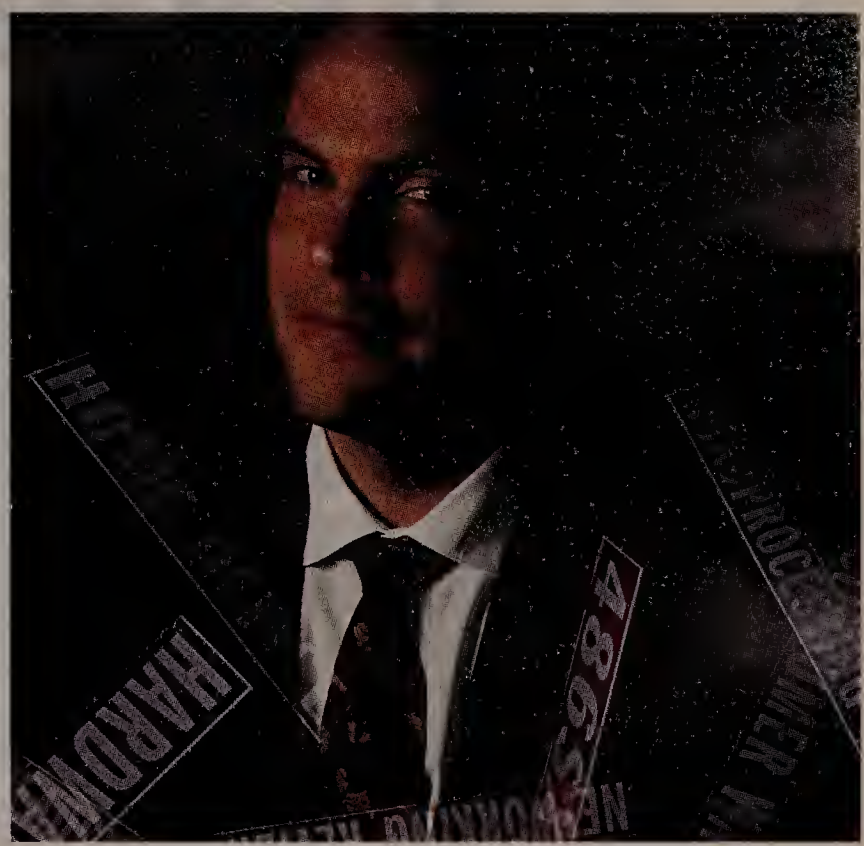
How do you improve on success? You do what any sane businessperson does: Ask your customers what else they want. Then you give it to them, plus a little bit more.

That's precisely what we've done at *PC World*. The issue you hold in your hands—the reconceived, redesigned *PC World*—is primarily your creation. We've gone to extraordinary lengths, from surveys to focus groups to innumerable one-on-one conversations with readers, to find out exactly what you want from *PC World* and how you'd like it presented. Now, after countless staff meetings and late-night sessions (in which new ideas flourished, some old thinking met a bad end, and the no-nonsense, reader-driven spirit of the magazine prevailed), we proudly present the new and improved *PC World*.

How could we possibly meet the individual needs of 3 million readers? We began by responding to your request that we make it easier for you to find your way around. So instead of dividing the heart of the magazine into reviews and features, we've organized it the logical way: by subject. Turn to this issue's table of contents, and you'll quickly find your way to articles on *Windows*, systems, and mail-order service and support—plus our cover story on upgrades and our special report on presentation graphics.

Tips fans will find their favorite how-to columns in their familiar location, under a new rubric: Here's How. You asked for more how-to-use information and an easier way to find the advice you need most. Here's How delivers, with more tips and a new, clean format that makes it a cinch to locate tips by subject. We've also renamed and expanded our two most popular columns: *Help Line*, formerly *The Help Screen*, continues to answer questions of all kinds from readers, while *Dialog Box*, previously *Star-Dot-Star*, remains a forum in which you can share hard-won technical wisdom with others.

In reviews, we've responded to several clear messages. You asked for software evaluations that show what it's like for real people, not just experts, to use an application. This issue features Deke McClelland's "Presentation Software Playoffs," a new type of review that draws on the opinions of ten typical readers to pick the best of six leading *Windows* and four top DOS presentation packages.



Earlier this year we answered your request for greater depth of coverage by expanding our monthly hardware roundup reviews to look at 25 PCs; you countered by asking for a better way to sort the winners from the losers among the contending systems. Our new High Five charts (which showcase the five lowest-priced PCs, the five fastest, and the five with the best service and support) simplify choosing the system that suits you best.

That essential refrain—make it easier to find key information—guided our thinking throughout. As Art Director Miteh Shostak, the force behind the redesign, puts it, "We've tried to build a reader-friendly format that helps you navigate, whether you're scanning the table of contents, paging through a section, or studying an individual story." Susan Casey, the energetic, award-winning designer commissioned by Shostak, used this principle as a touchstone as she shaped a new look for *PC World*.

Nowhere are Casey's talents more apparent than in the revised news section. Here you'll discover a lively, illuminating approach to up-to-the-minute information. And as you asked, we've more than doubled the number of late-breaking stories to help make *PC World* the best single source of information on PC products, trends, and solutions.

The editor, corralled by key elements of PC World's friendly new format.

For another example of information tough to find anywhere else, turn to this month's reader survey results. You'll see how over 4000 readers rate the service, support, and reliability of the top mail-order PC vendors.

So hats off to you for all the great suggestions. We're proud of *PC World*'s sleek new look and expanded content, but without you to guide us, we'd have been flying blind. As the fax-back survey in this issue demonstrates, we're still listening. Keep telling us what you want, and we'll keep delivering—and maybe even surprise you in the bargain.

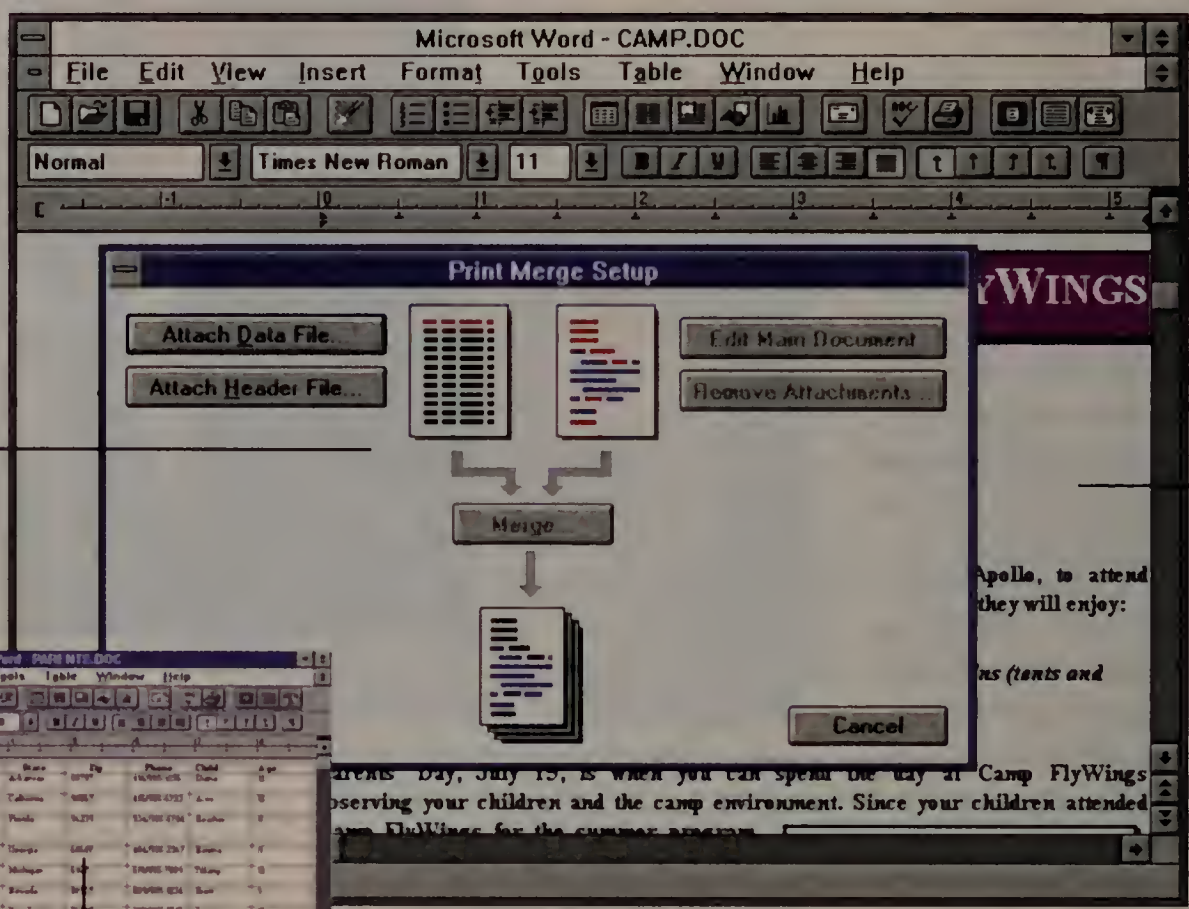
Eric Knorr

Eric Knorr, Editor

MICHELE CLEMENT

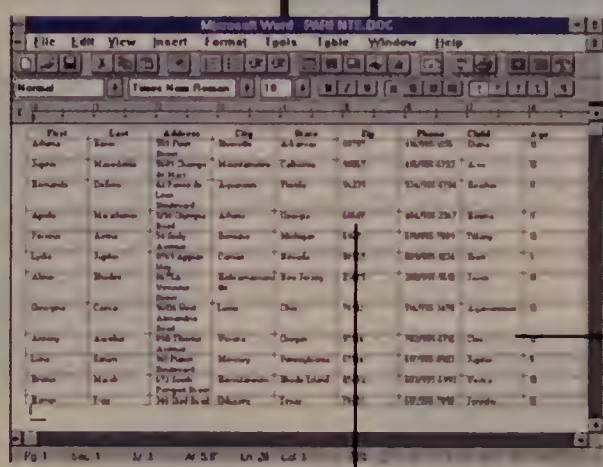
Their Word.

Microsoft Word 2.0 Mail Merge



1

Want to mail-merge documents using Word? Then be prepared to spend an afternoon reading the manual. Word gives you this nice diagram, but what do you do first?



2

Want to add, delete, or rearrange the order of the information in your data file? With Word, it's cut and paste, cut and paste, cut and paste. A pretty wordy exercise.

3

Data files in Word are set up in tables, which (hopefully) look something like this. Not a very useful way to look at data. And your field names can only be one word long!

4

What's your merged document going to look like? With Word, you never know until you print. Maybe your field names are in the wrong place? Words just can't describe how you'll feel when that happens.

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with any other offer. Please have your credit card and current word processor ready when you call. In Canada, call **1-800-GO-LOTUS.** (Note: Microsoft Word screens

Against Ours.

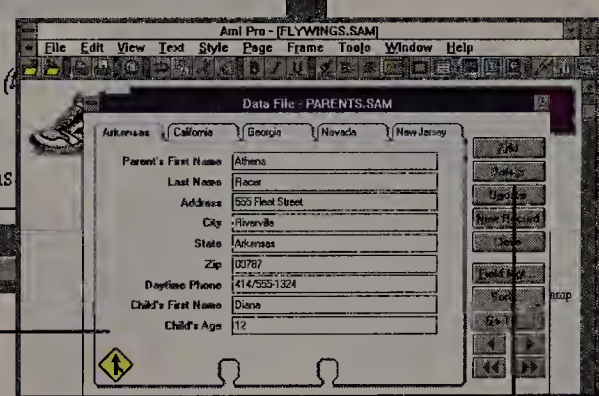
Lotus Ami Pro 3.0 Mail Merge

1

Ami Pro has a simple Merge dialog box that guides you step-by-step through the mail-merge process right on screen.

4

With Ami Pro, what you see is exactly what you get. Your mail-merged document is right there on screen with no surprises. Now isn't that why you buy a Windows word processor in the first place?



3

The built-in mail-merge database lets you create address records that look . . . well, like actual file cards. And view them one at a time. This may be the only database program you'll ever need.

2

Adding, deleting, editing, or rearranging mail-merge "cards" with Ami Pro is simple and direct. To make things even easier, the "Insert Field" box naturally stays open until you're done entering new fields.

There's no question about it. New Lotus Ami Pro® 3.0 is not only technically superior to Microsoft® Word. It's also far simpler to learn and use.

Take Ami Pro SmartMerge™ capabilities, for example. In easy-to-follow steps, Ami Pro guides you to effortlessly merged documents – even if it's your very first time. And only Ami Pro lets you preview and edit your merged document before you print. You can even choose to merge and print several smaller documents (such as business cards or invitations) onto a single page. Or create a data file "link" from another application altogether.

Ami Pro is the only word processor designed from the ground up for Windows.™ And only Ami Pro 3.0 offers you unique features like a Style Sheet Viewer that lets you preview your Style Sheets before selecting. One-click SmartIcon™ commands. A Clean Screen command that maximizes your workspace. Context-sensitive Help attached to each dialog box. And a QuickStart tutorial to get you up and running in no time.

So don't take their word for it. Or even ours. You be the judge. Order your free working model of Ami Pro 3.0 today by calling **1-800-872-3387, ext. 6965.** Or better still, upgrade from your current word processor* for just $129 and take advantage of free 24-hour support along with a 60-day money-back guarantee.

Lotus Ami Pro 3.0 Word Processor for Windows

evelopment Corporation. *Offer expires March 31, 1993. Call for a list of eligible word processors. Education priced Lotus products not included. Not to be combined
ere created with Microsoft Word 2.0A using Windows 3.1. Ami Pro screens were created with Ami Pro 3.0 using Windows 3.1. Both were created using TrueType fonts.)

Circle 175 on reader service card

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Circle 42 on reader service card

386 PCs as Doorstops, Legalize Piracy, the Windows War . . .

A Bargain or Just Cheap?

Quite frankly, the tone of the *What Next?* column in August was just a bit flip for my taste. Perhaps Mr. Hogan should take a trip over to the small-business and not-for-profit side of the tracks. He intimates that 386 machines will soon be useful only as doorstops. That may be true for the Fortune 500, but the latest lowering of chip prices—particularly for 386s—will allow many people to upgrade to the world of *Windows*. No, they won't be able to become power-crazed multimedia gurus, but maybe they'll be able to stay in business for another year.

Betsy Getreu, via PC World Online

Forced Into Gray Market Dealing

I would like to comment on "A Trip to the Gray Market" in July's *Consumer Watch*. I operate a small computer store in a small town. My volume is low, but quality is high. I looked at most of the laser printers on the market and decided that Hewlett-Packard had the best. So I applied to HP to sell its printers. The form the company sent me was eight pages long and contained many questions I didn't understand. I filled it out as best I could and returned it. My application was rejected, I suppose because I couldn't sell enough units. I decided I would sell the products whether the company approved or not.

I understand the need to maintain quality in distribution, but I've visited HP-authorized stores where the salespeople didn't even know how to load the paper. I am going to continue to sell and support HP printers because I 'd rather make a sale than refer someone to an authorized dealer 50 miles away.

Randall Ainsworth, Aberdeen, Washington

Conspicuously Absent

With both interest and disappointment, I noted the absence of any reference to Maxtor disk drives in your 200MB Hard Disks buyers' guide in August.

As of August 1992, Maxtor's 7213 (213MB) disk drive was the most widely accepted 200MB-class drive in the industry. Because of its low cost, the 7213 has become the entry-level capacity drive of choice for many 486-based systems.

In all fairness to your readers, the buying public, and the companies whose products you review, *PC World* should make every effort to publish information in a manner that more accurately portrays the market and the products available at press time.

Bill Hake, vice president, product management, Maxtor Corporation

Editor's note: Unfortunately, the Maxtor 7213 (along with a number of other drives in the 200MB range) was introduced too late for inclusion in our August buyers' guide. In an upcoming issue we'll revisit this class of hard disk, which is indeed proving to be popular with our readers.

A New Brand of Piracy?

There was a time when big software companies were concerned about software piracy. Now it seems that they have joined the club. No, they're not stealing software, they're trying to pirate each other's customers using a ploy known as the competitive upgrade.

I recently received a call from Lotus offering me *1-2-3 3.1* for $119. When I said I didn't own another spreadsheet program, the price jumped to $570. Is there a conspiracy in the software industry to get you to spend big bucks the first time and then take you for even more through the competitive upgrade? Vendors seem to think it is profitable to sell their product at a quarter the suggested retail price if you already have a similar product. Why wouldn't it be just as profitable to offer this price to first-time buyers?

R. G. McCarty, Somis, California

Who Needs Windows?

Many thanks to Daniel Tynan for his article "DOS Applications Still Dominate" in the August *Industry Outlook*. How about a follow-up article on the relative merits of *Windows* and DOS? I'm still trying to find out why *Windows* is supposed to be so great. Honestly, why are thousands of adults across the country dragging little pictures around the screen like third-grade kids with coloring books? Apparently the really great feature of *Windows* is its capability to open more than one program at a time. Couldn't someone design a DOS shell that does that without all the artwork?

PETER HOEY

Harold K. Farr, North Conway, New Hampshire

Of late, I've noticed many letters to the editor that knock *Windows*. Some exhibit an antipathy to *Windows* that is almost paranoid. *Windows* applications may have been slow and crash prone once, but this is no longer the case. PC users who retain a mental block against *Windows* are missing out on the best software available. Try a late-version *Windows* program on a fast 386 with at least 2MB of RAM, and you'll find it stable, usable, and better than DOS programs. This kind of hard-

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Circle 127 on reader service card

ware is already becoming standard in entry-level machines, so there really is no excuse to knock *Windows* on the grounds of stiff hardware requirements. Instead of being firmly rooted in the past, users should go out there and open a window.
Ken G. Wong, Klang, Malaysia

A Real Problem

I'm a loyal reader and satisfied subscriber, but I think there's something missing from *PC World* (and all the other magazines—the whole industry, for that matter!).

The overwhelming majority of every issue's subject matter centers on hardware and application features and specifics. You know, nuts, bolts, gadgets, and doodads.

Yet after reading each issue, I find myself asking, What can I really *do* with all these swell new things? I bet I'm not alone. In today's business environment, results-oriented users surely ask themselves if their hardware/software investments are being maximized.

I'd like to see articles that show what kinds of *real* problems *real* people operating in the *real* world are solving using actual hardware and software. How do they do it? Where did they get the idea? What neat tricks did they use? How much money did they save? Did they save the company? Their job? Somebody's life?
Peter M. Kapcio, via PC World Online

Editor's note: Funny you should mention it. In this issue you'll notice a new column called *Real Problems, Real Solutions* that we hope will fill the bill. In fact, we welcome contributions to this column, which will appear in every issue of *PC World*. To submit an idea, send a proposal outlining a PC-related problem and your solution to *Real Problems, PC World*, 501 Second St. #600, San Francisco, CA 94107, or fax it to 415/442-1891. Not only will you receive $300 for a published submission, but you'll also have a nice clipping to show your boss.

Chevy or Shuttle?

In "OS/2 2.0 Challenges Windows 3.1" in the June issue, Peter D. Varhol declares OS/2 2.0 the winner. He says that OS/2 is a 2000-ton space shuttle, while *Windows* is a used Chevy with a fresh coat of paint and bald tires. Now, it seems to me that it takes an astronaut years of training to fly the shuttle, while just about anyone can drive a Chevy.

As a matter of fact, as long as you obey the rules of the road, the only way you can go wrong in a Chevy is if you're under the influence. However, you can be stone-cold sober, wide awake, and in full command of all your faculties and still wreak havoc in the space shuttle. Granted, the shuttle is the pinnacle of scientific achievement, but it took four or five years to get the toilets to work. In addition, you have to buy a big, expensive garage for the space shuttle, whereas an old Chevy fits in the garage you already have.
Alan Fisher, Nashville

I read "OS/2: A Better DOS Than DOS?" in July with great interest. However, the sidebar "Installation: Don't Try This at Home" didn't reflect my experience. I have a 386-33 system at home. When I installed OS/2 for the first time (without reading ▶

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the documentation), I made a few mistakes and had to redo it. The second time, I had no problems. It probably took me 4 hours total. After running OS/2, I found that I needed more memory. So I got 4MB more. Ever since, I have loved it! OS/2 is fast and pretty stable.

My biggest problem now is how to convince my boss to replace my old 286 machine with a machine that is capable of running OS/2.

Dries Bessels, Amsterdam, Netherlands

Shareware Tip

I enjoyed reading the special section about utilities in the July issue very much. In the interest of those users who have limited budgets, I would like to mention the shareware memory management program that I use, *The Last Byte Memory Manager* from Key Software of Menlo Park, California. With *The Last Byte Memory Manager*, I can do virtually everything that the reviewed memory managers can do, and the upgrades are free. Since I'm still plugging away on an old 286 system, this suits me just fine. Shareware is not necessarily inferior anymore!

Edward Janeczko, Jr., Papillion, Nebraska

The Rest of Us

I recently subscribed to *PC World* because you have apparently made a commitment to communicate with "the rest of us."

I have a thirst for computer knowledge, but my experience is limited. So a magazine that talks solely to experts not only wastes my time and money, but discourages me. *PC World* articles are comprehensible, interesting, and full of useful tips. Thousands of individuals like me desperately need the kind of information that you are providing.

Mona Wenzel, Los Angeles

Not Dull Enough

I am a recent subscriber to *PC World*, and after reading a few issues, I find that I am greatly disappointed. I never suspected that a magazine existed that was so far behind the competition in dullness, reader unfriendliness, inaccuracy, and the ability to cause confusion. I think your magazine deserves a "Product of the Millennium" award. Keep up the good work.

Soumya Ray, Calcutta, India

Forced to Trash Disks

I protest the unnecessary contribution that some software companies make to the solid-waste problem. Why can't they provide us with disks that can be recycled when upgraded versions replace them? With the rapid turnover in versions, those of us who to run a number of applications and need to stay up-to-date are forced to add our old, obsolete disks to the solid-waste system. By giving us disks that have full read/write capability, software companies would make a minor contribution to the solution of that problem.

For the software publishers, an advantage of this scheme is that the superseded versions of their applications wouldn't be around for unauthorized use.

Richard Starkey, Chicopee, Massachusetts

Editor's note: Installation programs are often shipped on write-protected disks in order to prevent accidental damage to your software. Once you've upgraded the program and no longer have need for the installation files on those old disks, try using a hole puncher to cut a notch in the disk (look at a normal disk to see where the notch belongs). That should make it fully functional.

Too Dear

Thanks for the review "Personal Rewritable Optical Drives" in September. I need a rewritable drive, but have held off on buying one for several years now because of the high prices.

In 1984 Hewlett-Packard shocked the computer world by introducing an affordable laser printer at about $3500; later they increased the pressure on the competition by cutting that price in half. By combining quality with affordable prices, HP now dominates the market. Are you listening Pinnacle, Liberty, OCEAN?

Alan D. Latta, Toronto, Ontario

Corrections

Due to a production error in the Test Report for our August "486SX PCs: Double-Time Performers" review, the colors of the performance bars for the 20-MHz 486SX and the 20/40-MHz OverDrive were switched.

We mislabeled the *File Director* screen shot as an *XTree* screen on page 208 of the DOS shells buyers' guide in the September issue. The screen shown illustrates how *File Director*'s simple interface hides some powerful features, such as the capability to delete directories or move them between drives.

Also in the DOS shells buyers' guide, we omitted the reader service number for Brown Bag Software's PowerMenu 6.0 and PowerMenu Plus 6.0. For more information about these products, circle reader service number 687 on the reader service card in this issue.

PC World regrets the errors.

Mail your reactions, responses, and ideas to Letters, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Letters; CompuServe, 74055,412; MCI Mail, PC World Editorial; or 415/442-1891 (fax). Include your name, city, state, and phone number. We reserve the right to edit letters.* ■

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*Suggested U.S. list prices for HP 486/25N and HP 486/33N Model 1 PCs. †Press 1 for HP First, reference Document ID 6310, 6311, 6313. Microsoft is a U.S. registered trademark of Microsoft Corporation. Windows 3.1 is a product of Microsoft Corporation. The Intel Inside logo is a U.S. trademark of Intel Corporation. © 1992 Hewlett-Packard Company PPG-656

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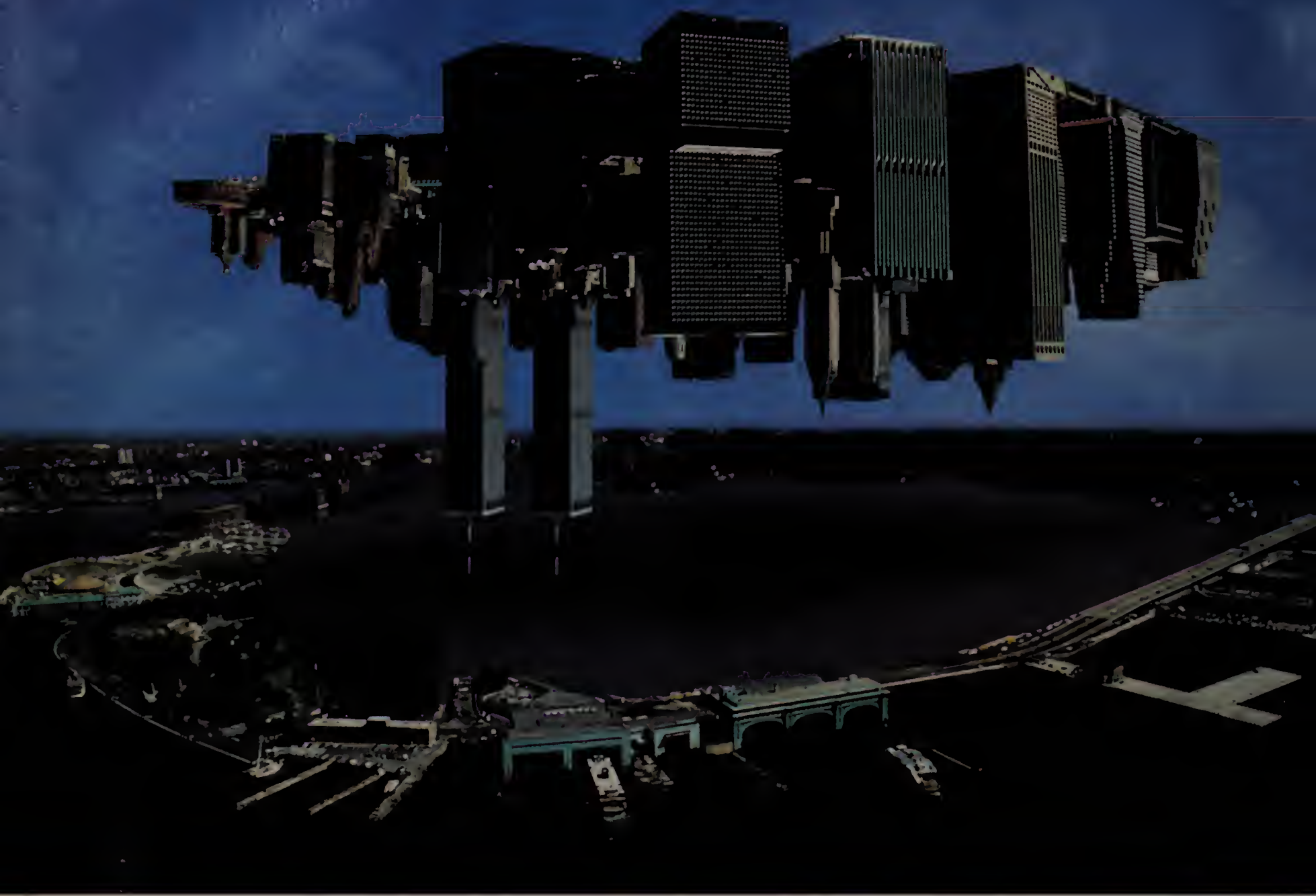

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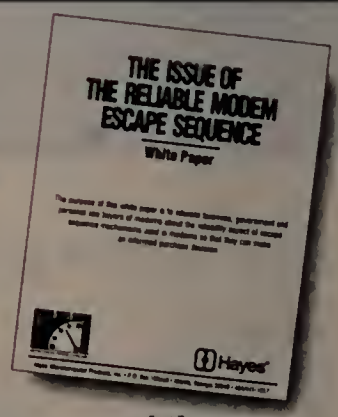

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Circle 105 on reader service card

Shopping for Support in Turbulent Times

Allen Friedman knew just what he was looking for when he bought a 486 from Strobe Computer, a small mail-order firm in Walnut, California. "I'd been through the [buying] process before, so this time I was just shopping specs and price," says the marketing consultant from Yardley, Pennsylvania. A technically savvy PC user, Friedman read through advertisements in computer magazines and called around to local dealers before settling on the firm he felt could offer him the most computer for his money.

Friedman got the computer and is thrilled with its performance. But the documentation was missing, and now Strobe isn't answering its phones. Friedman apparently isn't alone in his predicament: *Consumer Watch* has received several complaints about Strobe. Some customers report receiving incomplete orders; others have yet to receive anything at all.

Strobe has not responded to *Consumer Watch*'s phone and mail inquiries, and the status of the company is unclear. Tracy Sotelo, executive secretary for the Walnut, California, Chamber of Commerce, said her office has been getting 15 calls a day about Strobe, primarily from disgruntled customers. Sotelo also indicated that Strobe is being investigated by the Los Angeles County district attorney. We will continue to investigate and report our findings. In the meantime customers should contact their credit card company if they were charged for goods they haven't received.

Understandably, Friedman is worried. "I have a system without any documentation; if it ever breaks down, I don't even know the basic setup," he says. "There's nothing wrong with the computer now, but with Strobe [presumably] out of business and no documentation, what happens if the computer breaks?"

ROBERT CARDIN

by Roberta Furger

That's a question more and more PC owners are asking themselves as our poor economy takes its toll on small computer companies. Some analysts predict the number of PC vendors could be reduced by half as early as mid-1993.

If this happens, notes Alan Andrus, vice president of service and support for ComputerLand, it may be no easy task getting repairs. Key components, such as motherboards and power supplies, are still fairly customized and can't be easily swapped from one computer to the next, says Andrus. "And if you can't get replacement parts, you don't have a machine."

Certain motherboard designs, such as those with built-in video and serial and parallel ports, can complicate repairs, says Carl VonKoepping, service manager for Compupair, which repairs PCs in the Denver metropolitan area. "If the video goes out or you have a problem with the I/O, you may wind up having to replace the whole motherboard," he warns, "*if* you can find one with the same mounting holes and with bus slots that will fit the case." It's not unheard of, says VonKoepping, to have to replace the motherboard, power supply, and case—at a cost of anywhere from $500 to $900.

Power supplies are also problematic, says Wade Alexander, director of parts and purchasing for The Computer Fixer, a national PC repair company serving New England, the upper Midwest, the mid-Atlantic states, and California. He suggests steering clear of desktop computers with power switches in front, since you run a greater risk of not being able to match up a power supply to fit the case.

PC World Consumer Watch editor Roberta Furger

Given the ongoing predictions of a continued shakeout in the PC industry, service experts are advising customers to look beyond specs and pricing and to investigate third-party service options before settling on a system.

In particular, look for a vendor that has an established relationship with a third-party service provider. While on-site service used to be limited to only a few of the larger direct sales firms, it's becoming an increasingly popular option. In our April 1992 buyers' guide of 100 mail-order 386s, for example, only a handful of companies lacked this option (although many charged for the added service).

Third-party service contracts can be more than just convenient for users. They can also provide a second source of repairs should the PC vendor go out of business, since the third party will have necessary technical documentation and possibly even a spare-parts in-

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NEC	83,83M,84
NEC	BFU35
PANASONIC	CR 501S, CR 501B
PANASONIC	LKMC501S/B
PIONEER (DOS & OS/2)	DRM-600
SONY	CDU-541
TEXEL	DM-5020
TOSHIBA	XM2200A
TOSHIBA	XR3301

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LMSI	LF511
LMSI	LF512
LMSI	LF521
LMSI	LF522
MITSUBISHI	MW5G1
PANASONIC	LFJ7000
PANASONIC	LF J5000
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REFLECTION SYSTEMS	RF11JM
REFLECTION SYSTEMS	RF47J
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ARCHIVE CORP.	VIPER 150 S
ARCHIVE CORP.	VIPER 525 S
CIPHER	ST150
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EXABYTE	EXB 8500 8 MM
GIGATREND	MULTIDAT
HEWLETT PACKARD	35470 A DAT
HEWLETT PACKARD	35480 A DAT
JVC	XM-55442ES DAT
MAYNARD	1300 DAT
R-BYTE	RB-100 DAT
SANKYO	CP-150 SE
SANKYO	CP-525 SE
SANKYO	ST-1501/X
SANKYO	ST-5251/X
SONY	SDT 2000
TALLGRASS	FS500
TALLGRASS	FS1000
TALLGRASS	FS4000 ES
TANDBERG	TDC 3660
TANDBERG	TDC 3820
TEAC AMERICA	MT-2ST/N50-75
TEAC AMERICA	MT-2ST/F50 + B
TEAC AMERICA	MT-01N
TECMAR	QT 1000
TECMAR	QT 250 ES
TECMAR	QT 525 ES
TECMAR	DATAVAULT DAT
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MAGSTORE	MEGABOX MINI 128
MAGSTORE	MEGABOX MINI 256
MAXOPTICS	TAHITI 1
MAXOPTICS	TAHITI 2
MITSUBISHI	ME-3U1-M21
MITSUBISHI	ME-5U1-M21
MOST	RMS-128E
PANASONIC	LF3000
PANASONIC	LF3004
PANASONIC (DOS & OS/2)	LF9000
REFLECTION SYSTEMS	RF 3010
RICOH (DOS)	RO-5030E
RICOH	RO-5031E
RICOH	RO-5030EII
RICOH	RS-9200E
RICOH	RS-9200EII
RICOH	RS-9200EX
SHARP (DOS & OS/2)	5.25 M/O
SONY	SMO S501
SONY	SMO-S350
TEAC	OD-3000-30

MULTIFUNCTION DRIVES
DOS OS/2 Novell

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LMSI	LD520
MAGSTORE	MEGABOX LF7010E
MAGSTORE	MEGABOX DES7001
PANASONIC	LF7010
PANASONIC	LF7014
PIONEER	DE-7001
REFLECTION SYSTEMS	RF7010
SONY	SMO-E511

WORM DRIVES
DOS OS/2 Novell

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ATG (DOS & OS/2)	GD6000
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CHEROKEE (DOS & OS/2)	M610
KODAK (DOS & OS/2)	6800
LITERAL (DOS & OS/2)	525GB
LMSI	LD510
LMSI (DOS & OS/2)	LD4100
LMSI (DOS & OS/2)	LD1200
MAGSTORE	MEGABOX LF5010
MAXTOR	RXT800
MITSUBISHI	MW5U1-U11
PANASONIC	LF5000
PANASONIC	LF5010
PANASONIC	LF5014
REFLECTION SYSTEMS	RF7010
PIONEER	DD-5001
PIONEER	DD-5101
RICOH	RS-9100H
RICOH	RS9200F
SONY	WDC-6.5GB
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NOTE: NOVELL means NetWare 386 version 3.11. All product and company names are trademarks of their respective companies.

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ventory for the computers that it services.

Steve Clancey, associate director for desktop support services at market researcher Dataquest/Ledgeway in Boston, suggests talking to third-party service providers before buying a system from a lesser-known vendor. "Find out if and how they support the system and whether or not they'll be able to meet service requirements if the company isn't around," he advises.

To be sure, shopping for service can add to the time it takes to buy a computer, and not everyone will be willing to put forth the extra effort. But with 50 percent of all PC buyers reporting a component failure within the first two years after purchase, it's time well spent. Unless, of course, you're ready to start viewing PCs as throwaway items.

Third-Party Service Providers

- Bell Atlantic Business Systems Services: 800/767-2877
- Bull HN Information Systems: 800/343-6665 (supplies), 800/226-4357 (technical assistance)
- Dow Jones: 800/532-7373
- General Electric Computer Service: 800/937-9550
- Grumman's System Support: 800/922-1225
- Intellogic Trace: 800/531-5770
- Memorex Telex: 800/950-3465
- NCR: 800/225-5627
- TRW/ComputerLand: 800/722-2736

Shop Talk

Signs of the Times

On June 5 I ordered a 33-MHz 486DX from Blue Dolphin Computers. My credit card was charged the next day, although I have still not received the computer. Now the toll-free number has been disconnected.

I've contacted my credit card company to see what, if anything, can be done about capturing the amount charged to my account. They are investigating matters from their end.

James Edwards, Laurens, South Carolina

Editor's note: Blue Dolphin Computers of Burlingame, California, filed for Chapter 7 bankruptcy in the U.S. Bankruptcy Court in San Francisco on August 3. Customers who paid with a credit card for orders they haven't received should contact their credit card companies to determine if their account can be credited. If you're past the date to dispute charges or you paid by cash, you'll need to file a Proof of Claim form with the bankruptcy court. Copies of this form can be obtained by calling the San Francisco court at 415/705-3200 or writing to the U.S. Bankruptcy Court, P.O. Box 7341, San Francisco, CA 94120-7341. Customers shouldn't hold out much hope for a refund, though. According to Trustee Charles E. Sims, 95 percent of Chapter 7 bankruptcies are "no asset" cases.

Blue Dolphin executives were not available for comment, but according to attorney Noel Kubota, who's representing Blue Dolphin, the firm's demise is the result of poor economic conditions. "Sales were good last year," he says, "and the firm moved to a new location and added staff anticipating the next year's revenue. But things took a downturn in the spring."

Documents filed with the bankruptcy court indicate that Blue Dolphin sales last year totaled more than $4 million. No provisions have been made for servicing customers' systems.

Held Hostage by Technical Support

For the past two years, I have been experiencing a frustrating problem with a Samsung full-page monitor. When I bought it, I didn't realize my editing career would be wholly dependent upon Samsung's provision of drivers for every program I wanted to run.

I am being held hostage by Samsung's only technical support person in America for these monitors. He doesn't have to know much because, although the Samsung name is on the monitor, Samsung claims not to be responsible for the display card or the software drivers. These are made by a company called Cornerstone Technology. This effectively means that there is no technical support from Samsung—only a great deal of lip service and finger pointing toward a company of which I do not consider myself a customer.

Robert Wang, Columbia, Maryland

Editor's note: As part of its agreement with Samsung, Cornerstone was to provide technical support for the boards and monitors. But about two years ago Samsung stopped buying from Cornerstone, and the relationship ended. Samsung took on the

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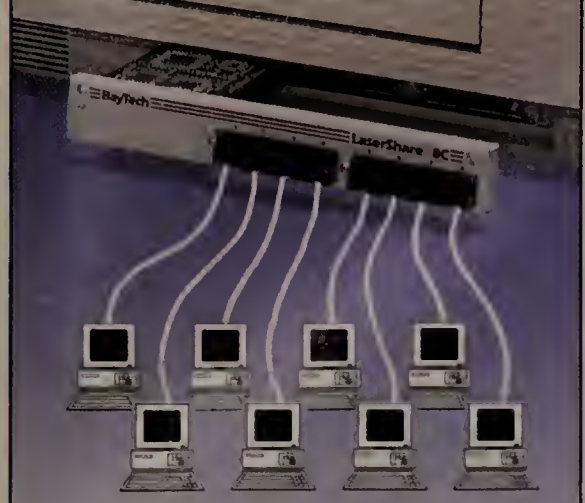

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task of supporting the monitors that it had sold. We contacted both Cornerstone and Samsung, and each in turn contacted Wang in order to resolve his problem. He now has the drivers he needs.

How I Caught Michelangelo

I recently purchased a personal computer from Eltech Research. I read a review in *PC World* that gave the Eltech Model 4200 a Best Buy at $1964. When I found the same computer advertised for only $1599, I was sold.

The computer arrived two weeks later, as advertised. After setting it up, my first step was to load *PC Tools*. As soon as I finished, the virus checker told me my hard disk was infected with the Michelangelo virus. I immediately scanned the *PC Tools* installation disk. No virus there.

I called Eltech immediately to tell them what I'd discovered. They told me this was the first report they'd had of this problem and that it was impossible for the computer to have been shipped with a virus.

I reformatted my hard drive to get rid of the virus and reloaded all the software. My computer is now virus free. And your review of the hardware was right on the money. I am very happy with the system.

My concern is that it is extremely irresponsible for a company to dismiss claims that they have a virus problem. The virus problem today is already out of control. When a company refuses to admit responsibility, it only compounds the problem.

Mark A. Radwick, Eatontown, New Jersey

Editor's note: Eltech told us that it started to investigate its software installation procedures immediately after receiving Radwick's complaint. The company apologized for having given him the impression that it had dismissed his claims. Eltech has not found any other cases of systems shipping with viruses. However, the firm now includes virus detection software with every system sold.

Model Customer Service

Our company recently purchased three portable tape backup units from Interpreter Tape Backup Systems, one of which was fried after six months—due to our own negligence.

We sent the unit back to Interpreter for repair, but when we got it back it had an intermittent tape error problem on multiple computers. After phone calls back and forth with Interpreter, we decided to return the unit for diagnostics. When we got it back, the problem still existed; after more phone calls, we sent it back a third time. The technician we had been working with said he could not duplicate the problem, but he offered to replace the guts of the unit anyway. The unit has since been returned and is working fine.

Even though we had caused the problem, this company felt the need to satisfy a customer problem.

R.G. Banse, Fulton, Illinois

What Price Compatibility?

I am a staff physician in a municipal teaching hospital. I give frequent lectures and have found it invaluable to have on-site access to PC-based graphics programs and a film recorder. I have a licensed copy of *Harvard Graphics 2.3* and jumped at the chance to upgrade to the *Windows* version, which in the advertisements and the literature circulated by Software Publishing Corporation is said to support Polaroid film recorders.

After installing my upgrade, I searched in vain for a *Windows* driver for the CI-3000 film recorder. No driver is available either through SPC, or through Microsoft as part of the drivers bundled with *Windows*.

After making numerous telephone calls, I discovered that the driver, developed by Zenographics, is available only through Polaroid and that it costs $395. I am very chagrined at this situation, since I paid only $113 for the upgrade to *Harvard Graphics for Windows*.

I have no doubt that the creation of a *Windows* driver is demanding, but I find it unconscionable that Polaroid is shaking down the existing base of CI-3000 users as well as potential buyers for a $395 driver. It is also misleading for SPC and the developers of other *Windows* graphics programs to claim they support this popular film recorder when in fact they do so only if the user is willing and able to buy this monopolized driver. To my mind, *Windows* graphics programs without drivers for commonly used hardware devices are incomplete.

James J. Heffernan, Boston City Hospital, Boston, Massachusetts

Editor's note: We contacted both Software

BUG WATCH

CorelDraw 3.0

Exported TIFF files that have been created in *CorelDraw 3.0*, the most recent release, cannot be read by certain software packages. Among the programs known to be affected are all versions of *WordPerfect for Windows, Ami Pro,* and *Word for Windows.*

In some cases, the images fail to appear in the destination program; in others, the destination program crashes and data can be lost. According to a Corel spokesperson, the problem stems from *CorelDraw 3.0*'s use of the latest version (5.0) of TIFF; several developers have not upgraded to this version, so their packages are unable to read files created in the latest version.

Corel is currently working on a fix, which will be made available to registered users at no cost. In the interim, users should save *CorelDraw 3.0* images in another picture format, such as PCX or BMP, that can be read by the destination program.

Corel Systems
613/728-1990 (24 hours)

Compaq LTE Lite Notebook

A faulty ROM chip is causing some Compaq LTE Lite notebook PCs to fail when the internal numeric keypad is used in conjunction with the optional external keypad.

The intermittent problem ranges from keyboard lockups to system unit powerdowns. It affects LTE Lite notebooks purchased in the United States with serial numbers prior to #220###, and systems purchased internationally with serial numbers prior to #221###.

Compaq's standard on-site warranty covers replacement of the faulty chip. LTE Lite owners with affected machines should call Compaq and request to have a technician dispatched to install a new ROM.

Compaq Computer
800/345-1518

—Richard Melville

Have you run into a software bug or a hardware incompatibility? Call us at 415/978-3253 with the details. We'll investigate problems and report on those with the broadest interest.

Richard Melville is an editorial intern for PC World.

Publishing Corporation and Polaroid after receiving Heffernan's letter. Software Publishing Corporation spokesperson Ishmael Estrada indicated that the company does not write *Windows* drivers for any of its products, given the complexity of the environment and the large number of output devices that are available.

According to Estrada, implicit in the claim to support the Polaroid film recorder are the facts that each device must have a *Windows* driver available for it and that the driver must be obtained through the hardware manufacturer.

Phyllis V. Laorenza, marketing publicity manager for Polaroid, indicated that Heffernan's only option is to purchase Zenographics' *SuperPrint for Windows* version 2.2. "If he owned *SuperPrint 2.0*, he could get the *Windows* upgrade directly from Zenographics for $79. Since he doesn't, he must purchase *SuperPrint for Windows* directly from Polaroid for $395."

According to Laorenza, "Microsoft does not provide direct drivers for any color-film recorders. As a result, Zenographics is filling the niche for high-speed *Windows* drivers for a number of color-film recorder and printer manufacturers. We are selling the Zenographics package as inexpensively as the economies of the situation warrant, and we believe the software is fairly priced."

Pricing issue aside, customers wishing to use the film recorder in conjunction with *Windows* packages must purchase the driver separately. Including a note to that effect in advertisements would go a long way toward eliminating the understandable confusion and aggravation that Heffernan and others have experienced.

Think you've gotten a raw deal—or a great one? Mail the details to Consumer Watch, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Consumer Watch; MCI Mail, PC World Editorial; CompuServe, 74055,412; or 415/442-1891 (fax). We'll investigate complaints and publish letters with the broadest interest.*

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Circle 111 on reader service card

SOME COMPANIES
WILLING TO PAY FOR A N
IT'S THE ONLY

Design. Engineering. Testing. Service. Support. When you think about it, these are what make one computer better than the next. Which makes it all the more surprising that companies are cutting back in these areas. And, amazingly, some do little but stick their name on at the end of somebody else's assembly line.

It would be like buying a car, looking under the hood, and discovering that it was built by a company you'd never heard of from a place you'd have trouble finding on the map.

It makes you wonder about the kind of company that would do it. Why they would make the decision to put their name on a product over which they maintain little control. And why they would then sell it to their customers.

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Find a way, any way, to cut costs.

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Precisely because all three of our new, affordable computers are true COMPAQ products, we back them with the same comprehensive service and support as the rest of our computers.

Other PC companies do things differently, like offering substantially limited service and support for products they apparently have less confidence in. Dell has even gone so far as to withdraw their

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MUST THINK YOU'RE AME. ON THEIR COMPUTERS, PART THEY MAKE.

compatibility guarantee for the Dimension Line.

Comparing COMPAQ computers with today's "name brand" clone PCs reveals other important differences as well.

With every computer that we build, you benefit from our reputation for industry-leading performance, reliability and durability.

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Circle 47 on reader service card

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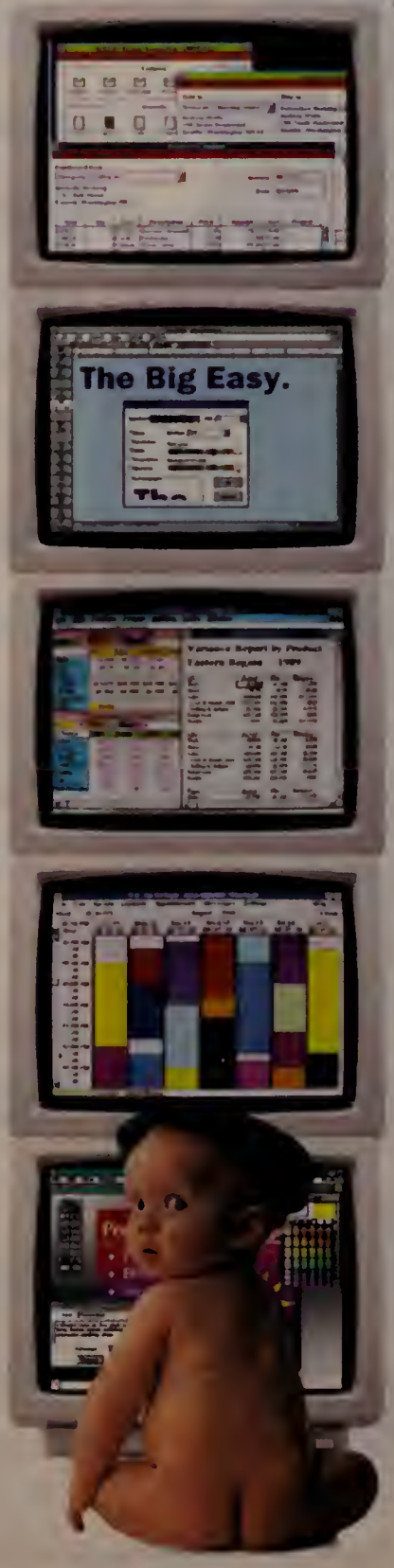
Crunching numbers is easy with this multi-dimensional spreadsheet. More advanced than two-dimensional spreadsheets like Lotus® 1-2-3®, Excel and Quattro® Pro, this is easier to learn and easier to use.



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No matter how busy you are, CA-Simply Business can keep your entire small business on schedule.

Simple, color-coded screens can tell you instantly who, what, where and when. And it can track hundreds of different schedules, as well as store tens of thousands of names, addresses and phone numbers.

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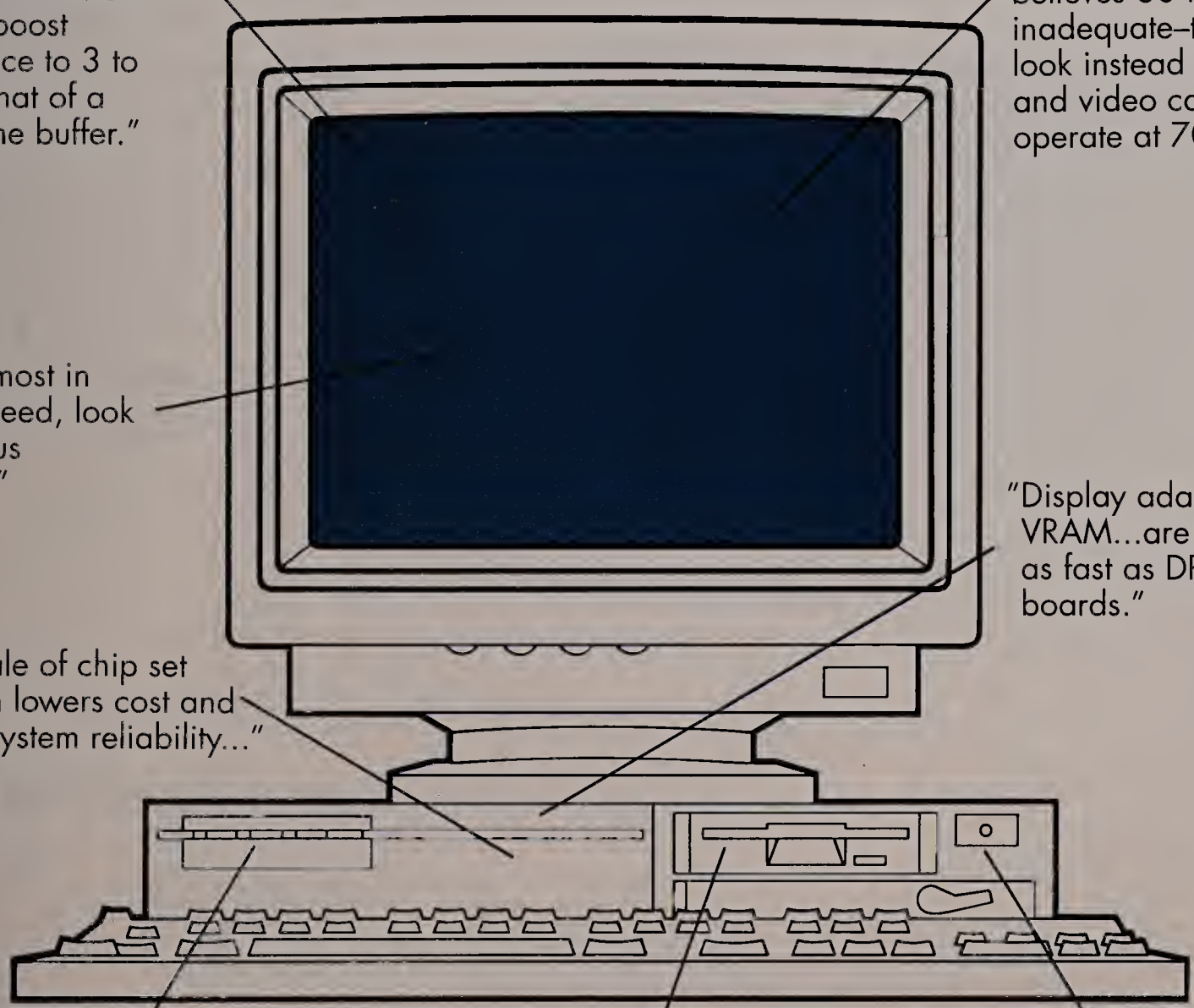
Circle 65 on reader service card

JULY 1992, PC MAGAZINE DESCRIBES THE PERFECT PERSONAL COMPUTER.



.if your ultimate PC ystem runs Windows, n accelerated VGA ard can boost erformance to 3 to 0 times that of a umb frame buffer."

"At 1,024-by-768 resolution, PC magazine believes 60 Hz is inadequate–too flickery–... look instead for monitors and video cards that operate at 70 or 72 Hz."

or the utmost in isplay speed, look t local bus esigns..."

"Display adapters using VRAM...are often twice as fast as DRAM-based boards."

high scale of chip set tegration lowers cost and nproves system reliability..."

save space, look for built-in arallel and serial ports, and E and video circuitry."

"To take advantage of a 32-bit operating system such as OS/2 2.0 or Windows NT (when it ships), you will want at least 8 MB of RAM, so a 16 MB motherboard may prove limiting in the next couple of years."

"Note that metal SIMM sockets are preferable to plastic ones."

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DECpc

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DIGITAL'S NEW P

Using VRAM instead of DRAM speeds video operation by minimizing graphics bottlenecks. 512KB is standard. Expandable to 1MB.

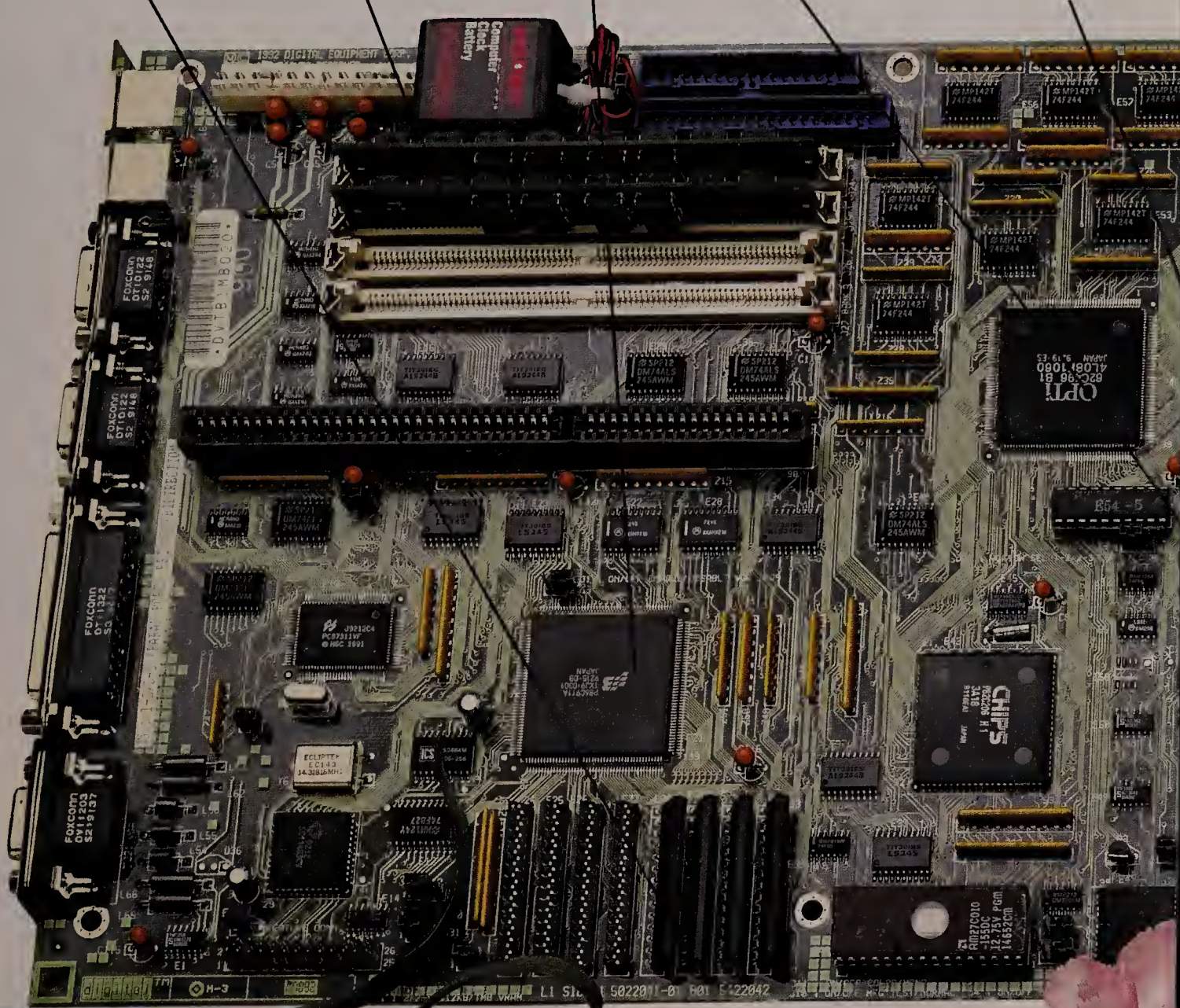
The built-in GUI accelerator makes Windows fly, yielding a four-fold speed improvement over standard VGA. With full 1024 x 768 resolution.

Our mother has a daughter. This one carries the microprocessor, cache and data bus for system upgrades.

P
48
486D
mic
availa

Add up to 64MB of RAM on this motherboard. Plenty of room for all the memory-hogs in your software collection.

The Vacancy Socket is the quick and easy way to upgrade your DECpc. Just add the appropriate Intel OverDrive™ Chip.



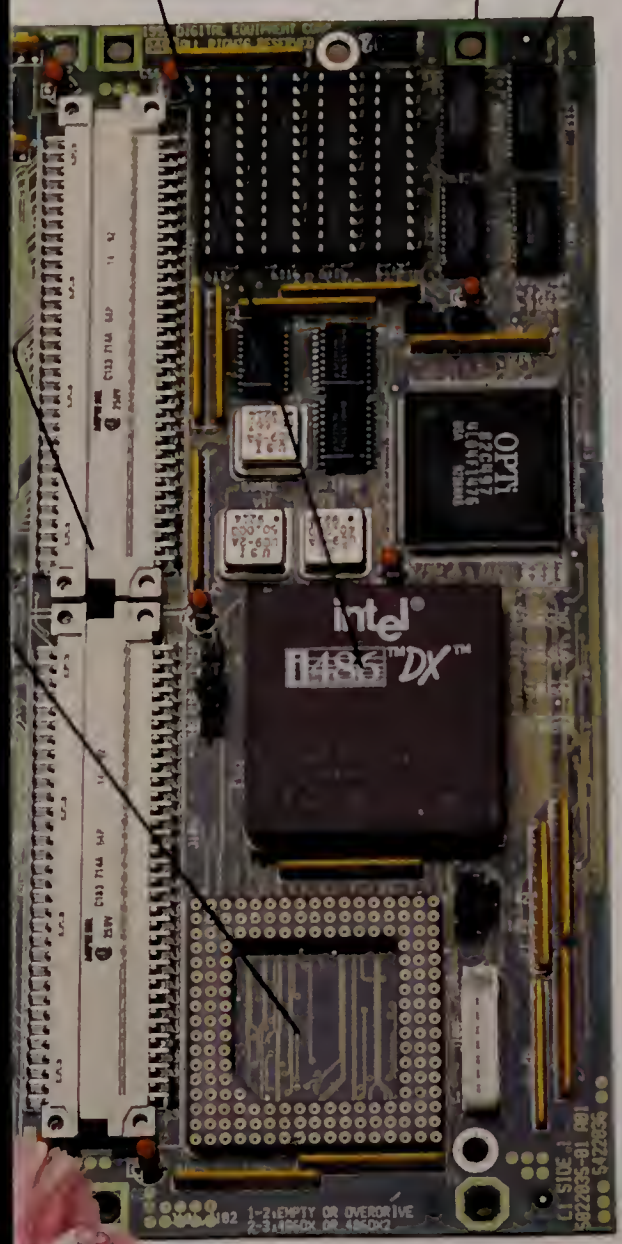
intel inside

Cs OWE IT ALL TO MOTHER

ck your brain.
SX, 486DX, and
2 industry-standard
roprocessors are
ble, in a wide range
of speeds.

For faster video performance, take the local bus. This 32-bit data highway means your DECpc's microprocessor never slows down for video access.

These DECpcs not only have a 128KB cache standard (with room for up to 256KB), it's writeback cache. That's the most advanced memory-caching strategy.



This couldn't be the perfect PC if it didn't have the perfect mother. Well, what a beauty she is.

Our new motherboard was born in Digital's very own, highly automated, ISO 9000-compliant factory. As opposed to somebody's garage.

But the real beauty of this mother is how much she does for you. She takes care of the floppy drive and the hard drive. Provides for the video controller and the GUI accelerator. Even tends to two serial ports and one parallel port. And because this motherboard takes care of all the basics, you can use her three expansion slots to truly customize your system.

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Shouldn't everybody have a mother like this?

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	DECpc 433dx LP	Compaq Deskpro 433/i	Dell P-Family 433
Upgradable	yes	yes	yes
Cache included	128KB	8KB	8KB
Cache maximum	256KB	64KB	256KB
GUI acceleration	yes	yes	no
Local bus video	yes	no	no
Maximum RAM	64MB	32MB	64MB
Hard disk bays	2	1	1
List price	$1,849	$2,449	$1,849
Estimated street price	$1,849	$2,252	$1,849
30-day money-back guarantee	yes	no	yes
Shipping included	yes	N/A	no

4MB RAM, 120MB hard drive, keyboard, mouse, DOS, Windows, no monitor. Competitive price survey 8/10/92.

	DIGITAL	COMPAQ	IBM	DELL
Free one year service performed by manufacturer	YES	NO	NO	NO
30-day, no questions asked money back guarantee	YES	NO	NO	YES
Multivendor service support available	YES	NO	YES	NO
Application support available	YES	NO	YES	NO

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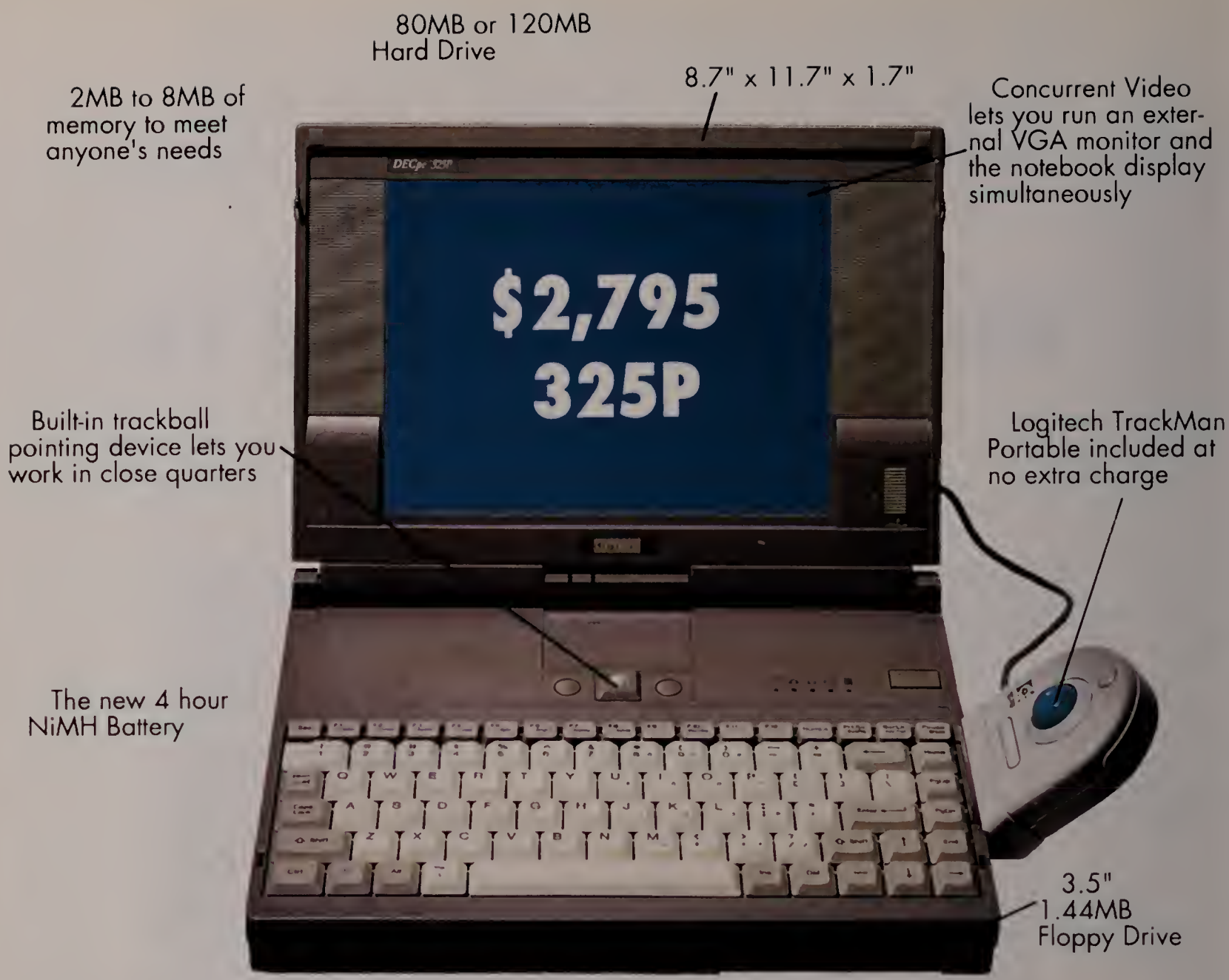

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- Prints up to 160 characters per second
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- Built- in IBM Proprinter® II emulation
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- Prints up to 200 characters per second
- Supports MS Windows
- Serial and parallel interface
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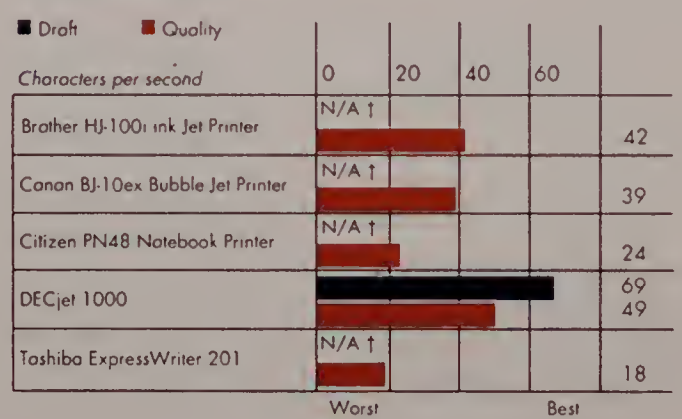
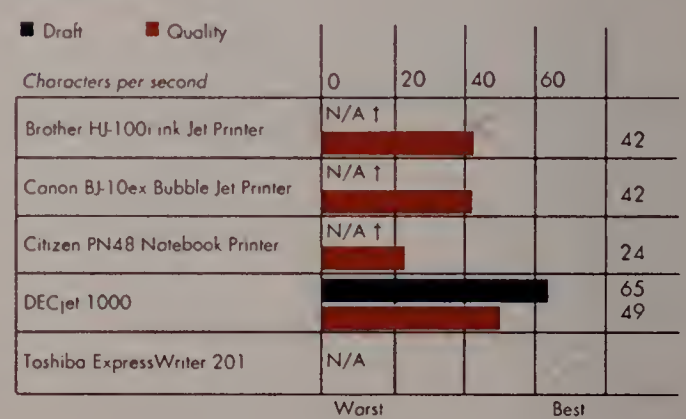
Epson Emulation



IBM Emulation



N/A † Not applicable. This printer does not operate in draft mode
N/A †† Not applicable. This printer does not support this emulation

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Mon-Fri 8:30am to 8:00pm (ET)

Can Your Hardware Handle Windows?

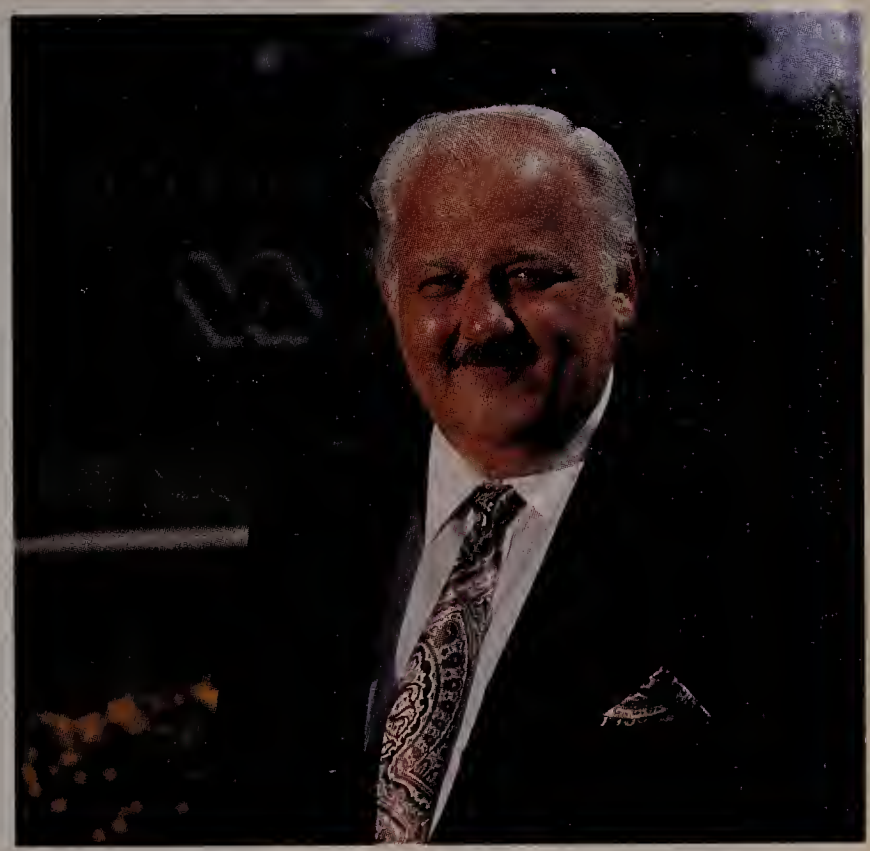
PC World readers who are also managers have been telling us that they want to hear more about real problems other managers face. Your wish is our command; beginning this month, we'll print a column written by a manager who's run into a problem, and we'll evaluate the solution he or she found.

This month we address the *Windows* speed issue. Many people are still *Windows*-shy because of its reputation for slowness. We talked to William O. Hawley, chief of the Information Resource Management Service at the Veterans Administration Medical Center in Perry Point, Maryland, to see how he dealt with the problem. Hawley manages a staff of nine technical people who serve 1500 end users of different systems—from PCs to mainframes—throughout the center. Currently, he is in the process of cutting purchase orders for 80 additional PCs. —*Ed.*

Hawley's Dilemma

I confess—I was a late convert to *Windows*. My staff and I, as well as all the other PC users at the Medical Center, just started using it in the summer of 1991. Although I liked the *Windows* applications I saw and believed that a graphical environment would benefit the end users in the company as well as my own staff, I wasn't convinced that upgrading all our PCs to run *Windows* was worth the cost. Most of the 50 Dell, NEC, Everex, and AST PCs at the center are 386s, but some staffers work with 286s. Users run *Windows* applications such as *Word for Windows 2.0*, *Excel 4.0*, *PowerPoint*, *Microsoft Project*, *CorelDraw*, and *Procomm Plus for Windows* and DOS applications such as *WordPerfect 5.1*, *PC Tools*, *FormTool Gold*, and *dBASE IV*.

Another reason I didn't buy into *Windows* earlier is that I heard it was slow. Microsoft applications are part of a nationwide office automation contract for the Veterans Administration, however, so we swallowed the upgrade pill; secretaries, program clerks, section chiefs, and transcriptionists began seeing new 386s on their desks. But when they'd run the spelling checker in *Word for Windows* or try to pull up clip art in *CorelDraw*, it would take so long to write to the screen that they'd scurry back to their DOS applications.



William O. Hawley of the VA Medical Center takes on Windows.

Sluggish displays can turn into a real problem if you're trying to get users to standardize on *Windows* applications. It's also frustrating when you've busted your budget on new 386s or 486s, expecting the speed problem to go away. The users blame the hardware or software, the boss blames you, and you feel like a fool.

Shortly after we bought our new 386s, a friend who runs *Windows* was showing me something on his system. I noticed that his PC was much faster than mine. I used *PC Tools* to look at his system configuration and discovered that his machine had a math coprocessor and graphics accelerator card. These additions seemed to make the difference.

As an experiment, I bought and loaded an Intel 80287 math coprocessor and a 512K Paradise Professional graphics video card on my 286. I also carefully followed all the tips I'd seen in computer magazines about optimizing my system, including using high memory, creating a virtual RAM drive with a TEMP directory, installing the proper drivers and SmartDrive, and using a disk optimizer. Also, I installed an intelligent hard drive controller to shorten the seek time on my drive. Suddenly, *Windows* on my old homegrown 286 was rocketing past the new 386 on my desk.

Because my role is to ensure that our center is running the latest technology, I've begun upgrading every PC at the Medical Center with extra RAM as well as Diamond Stealth or ATI graphics accelerator cards at $450 a pop. I've also spent about $150 each for Intel 80387 math coprocessors. Even though the cost of these upgrades was $500 to $700 per PC, we're recouping the investment by saving hours of labor and increasing productivity. Now users can see a print preview or do a grammar check 200 to 500 percent faster. They can work at the speed they need to—I don't see anyone switching back to their old DOS applications now.

While we seem to have solved the immediate problem at my company, computer users in general are facing a greater dilemma. Hardware manufacturers, software vendors, advertisements, and computer publications aren't telling us what we need to know to make intelligent decisions. They

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PC WORLD

Another Angle

The editors of *PC World* comment on Hawley's solution

Even a speedy 386 or 486 can get hung up on *Windows* applications, and Hawley's decision to purchase graphical accelerator cards was a good one. Graphics accelerator boards like the ones mentioned are specially designed to work with graphics applications and are a lot cheaper than buying a new machine. In our March 1992 issue, we reviewed 21 graphics accelerator boards priced between $100 and $900. In our December buyers' guide, we'll look at even more graphics accelerator boards, this time from about $100 to $400. Since board prices are plummeting, if Hawley were buying today, he might be able to upgrade for half as much as he paid last year, especially if he compared prices carefully, checking installation procedures and support policies.

Hawley was right to set up his CONFIG.SYS file as he did and to install a hard disk controller. However, unless he and his co-workers use DOS or *Windows* financial or statistical packages heavily, he could have saved some money by skipping the math coprocessor. While speeding certain math functions, a math coprocessor doesn't help directly, since *Windows* doesn't use the floating-point arithmetic that such coprocessors handle.

Hawley's money would have been better spent on even more RAM, which runs about $50 per megabyte. If you use memory wisely by not overloading it with applications, and use cache memory only if you have an application that benefits from it, you should also notice a marked improvement. (Be careful, however, of a cache that's too big; your PC will spend more time searching.) If you have enough memory to keep the applications you use every day loaded in memory rather than in virtual memory, you won't have to wait for your disk to churn. You can also speed up *Windows* by not using more than 16 colors or large-resolution graphics (higher than 640 by 480).

Regarding Hawley's frustration with hardware and software vendors—and publications—for not revealing these well-kept secrets, we'll accept at least part of the blame and hope real-life articles like this will help set the story straight. In our enthusiasm over the productivity gains we personally have experienced using *Windows* applications, we may have understated the hardware requirements. On the other hand, many of us at *PC World* run *Windows* on 20-MHz 386s with no accelerator or coprocessor. As Hawley discovered, such a system will run—just not very fast. Of course, we've been talking up graphics accelerators for years. Now let's hope everyone else hops on the bandwagon.

don't tell us we need a math coprocessor and a graphics accelerator board to make *Windows* run optimally. Instead, we undergo trial, error, and endless frustration to try to make *Windows* run faster using underpowered, improperly configured systems. Perhaps the powers that be think more people will move to *Windows* if the hardware price of admission is lower, but in the long run, this sort of thinking will turn users off.

So here's my solution: Every one of us—every PC buyer, every reader of computer publications, and every manager—must put pressure on hardware and software vendors to tell us what it takes to make *Windows* run optimally. We should write to system vendors, telling them to make it a policy to ask buyers who plan to run *Windows* if they'd like to add a math coprocessor and a video accelerator card, and explain why it's advisable. Likewise, software manufacturers should print more than just the minimum requirements on packages and in ads. Tell us what it really takes to get a functional piece of software. And publications like *PC World* should broadcast this issue.

If you use PCs to manage people and other resources in a business environment, we want to hear from you. Send your article idea—including a brief outline of your company, job, problem, and solution as well as your name, address, and phone number—to Real Problems, Real Solutions, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Real Problems, Real Solutions; or 415/442-1891 (fax); or call us at 415/978-3224. We pay $300 per published column. Sorry, we cannot acknowledge unpublished materials.*

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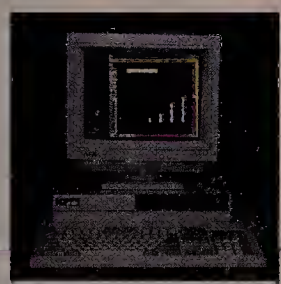

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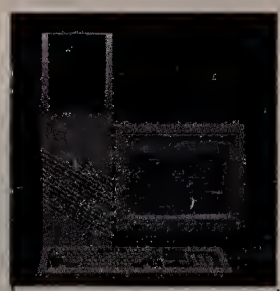

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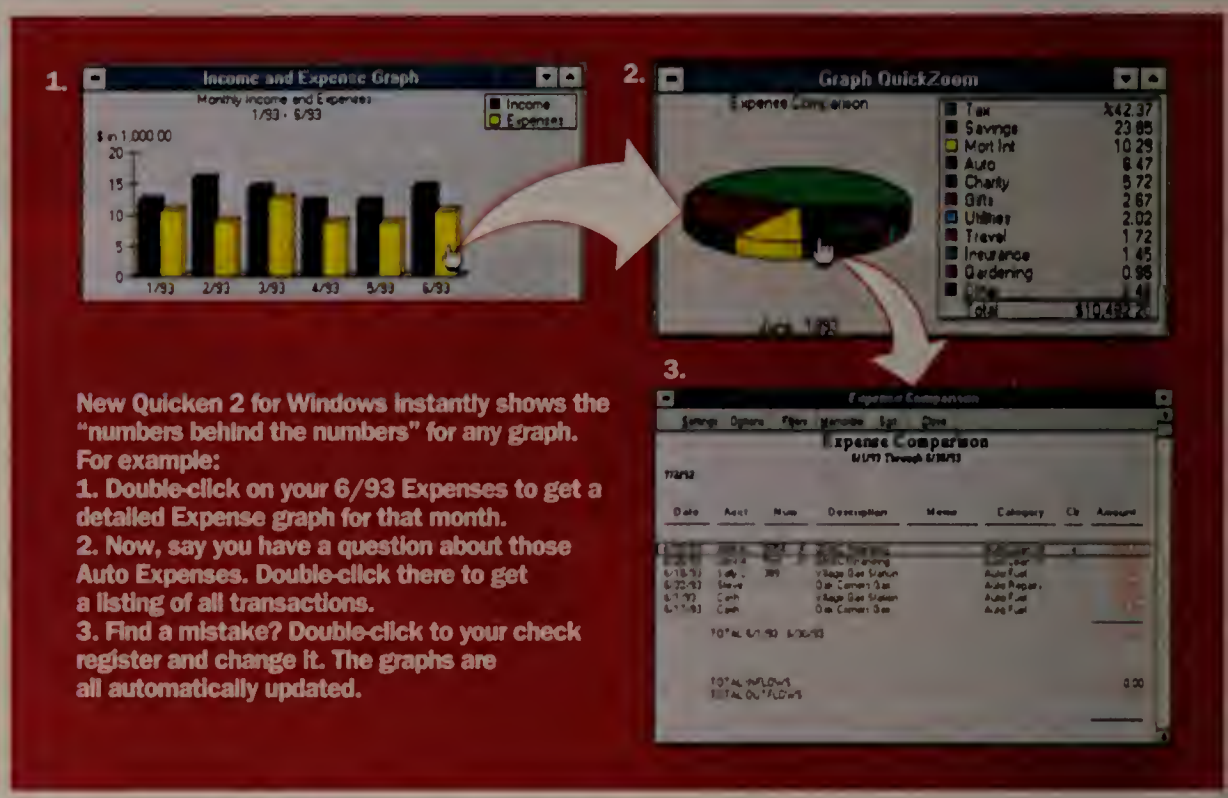

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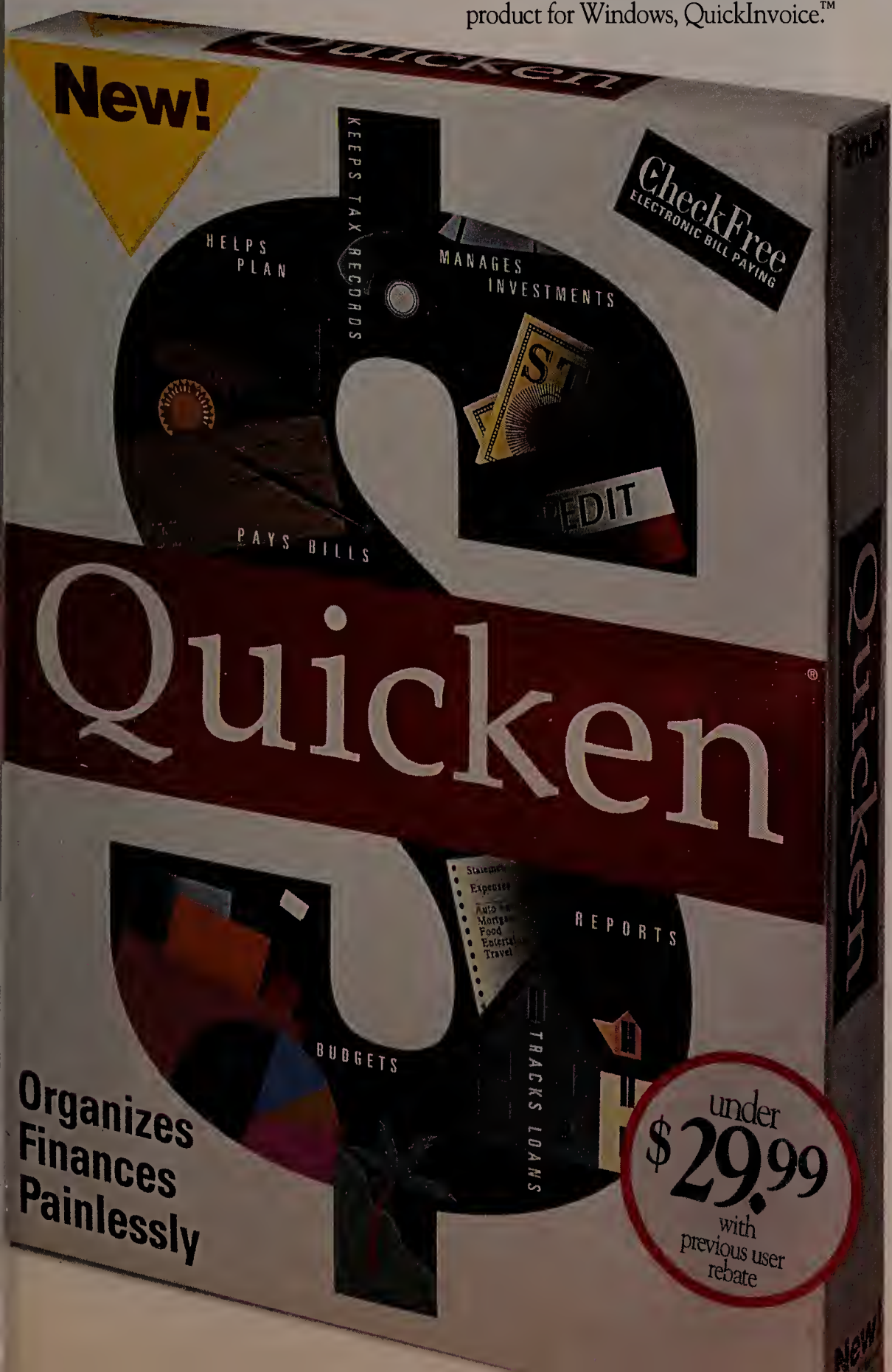

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Getting the Most Cock-a-Doodle-Doo for Your Buck

Here's an everyday problem: What's the best value? A $1799 Insight 486SX-25 with a 200MB hard drive, a $1995 Zeos 486SLC-25 with a 107MB hard drive, or a Dell 386DX-33 with a 120MB hard drive for $1749?

The answer's a snap. Just multiply the first digit of a system's CPU number by its MHz rating. Multiply that by its RAM, hard drive, and monitor size. Add slot, bay, and video memory totals. Divide by price, and a calculator battery or two later, you'll have a Cluck/Buck rating for all your PC choices.

I'm only half kidding. At least Cluck/Buck gives you some kind of construct for comparing today's mind-numbing array of PC types. Silly as my formula sounds, economists and vendors know that whenever we buy anything—a PC, a car, or a TV dinner—we make this kind of calculation. It's just that most of us do it unconsciously.

Marginal Utility Theory says that you and I walk around with hundreds or thousands of these price-to-value comparisons stored in our heads, depending on our own peculiar shopping interests. Go ahead, ask me about different sizes of type L and type M copper plumbing and kiss a half hour good-bye.

Some features are make-or-break—processor, RAM, hard disk, *price*. Slots, bays, cache, and video memory carry less weight. Most of us have figured out that our workhorse CPU has gotta have a 4, rather than a 3, in front of its name (nobody in his right mind would buy a 2). But pretty soon we'll have to consider 5s along with our 4s and 3s.

Should you grab one of today's bargain-basement 4s, wait and plunk down major change on a 5 with a DX attached, or kick back until after the 586-bug shakedown cruise and get a 5 with an SX suffix? Yes, we already know that Intel plans a P24T (586SX?) even as it struggles to get its P5 (586DX?) out the door. And what if your CPU has an SL, SXL, DXL, SLC, or DLC attached?

At last count, we had an uncountable number of processor flavors. Factor in extra memory for *Windows*, bargains on bigger drives, increasingly frequent software (and fax-modem) bundles—and, well, it's easier to pick a president.

PCs were commodities before Compaq's bombshell blew the hell out of prices. Now they're laundry soap, soda pop, deodorant. Does local-bus video or EISA send you charging into ComputerLand? Do you prefer diet, caffeine-free diet, or Classic processors—with *Windows* or without? Roll-on, powder, or environmentally safe VDTs?

Sure it's confusing, but confusion is merely the price we pay for choice. And with eight years of computing under their belts, average *PC World* readers intuitively make fine distinctions among products. That's why we no longer pay $6000 for the basic desktop.

So which is a better buy—the Insight, Zeos, or Dell? With 2 to 6 hours to kill, you could build a spreadsheet to find Cluck/Buck. Or you can call up America Online and download my Cluck spreadsheet file in *1-2-3* or *Excel*. Basically, Insight's combo of oversize hard drive and very low price put it out front.

Of course, Cluck doesn't compare with the PC World Test Center's far more extensive and elaborately weighted test suite. My calculations are bare-bones and leave out extras like cache memory, expandability, and software bundles that may make a big difference to you. Note, for example, that Insight lacks on-site support, while Dell has a panoply of service offerings. If your business lives on your PC, service may be as important to you as performance.

But at least Cluck adds a left-brain complement to your intuition. Customize it to reflect your preferences, and be ready for one helluva Christmas buying season. Get out there and find a dirt-cheap portable or desktop and really stuff little Johnny's or Suzie's stocking.

By Mike Hogan

WHAT TO WATCH

From a 486SX all the way to a 586SX? Zeos has slapped a 200-pin ZIF socket onto its 486SX motherboards, which means you can swap a 486SX with an OverDrive or the OverDrive's OverDrive, Intel's 64-bit internal/32-bit external P24T chip. That isn't even expected to be announced until after the first-quarter introduction of the P5 . . . . In November, Hewlett-Packard will begin shipping the HP DeskJet Portable, a 4-pound portable ink jet printer about the size of a cigarette carton, but with the full functionality of its DeskJet 500—300 dpi, 3 ppm, plain paper—for about $450 . . . . By then for under $1000, Zenith dealers will upgrade any Z-Note notebook with pen software and a pen-sensitive replacement LCD that can be detached and written upon . . . . Advanced OCR/data compression technology married to a sophisticated text-retrieval algorithm enables Caere's PageKeeper for Windows (about $700) to index files automatically and even create content-related links among network-resident and scanned-in documents, which later can be automatically decompressed and retrieved in order of importance . . . . Amaze Inc. ships two new volumes of the popular Far Side Computer Calendar and the Cathy Daily Planner this month with a calendar showing day, week, and month views, and adds an alarm for meetings, a to-do list, and, of course a new set of cartoons . . .

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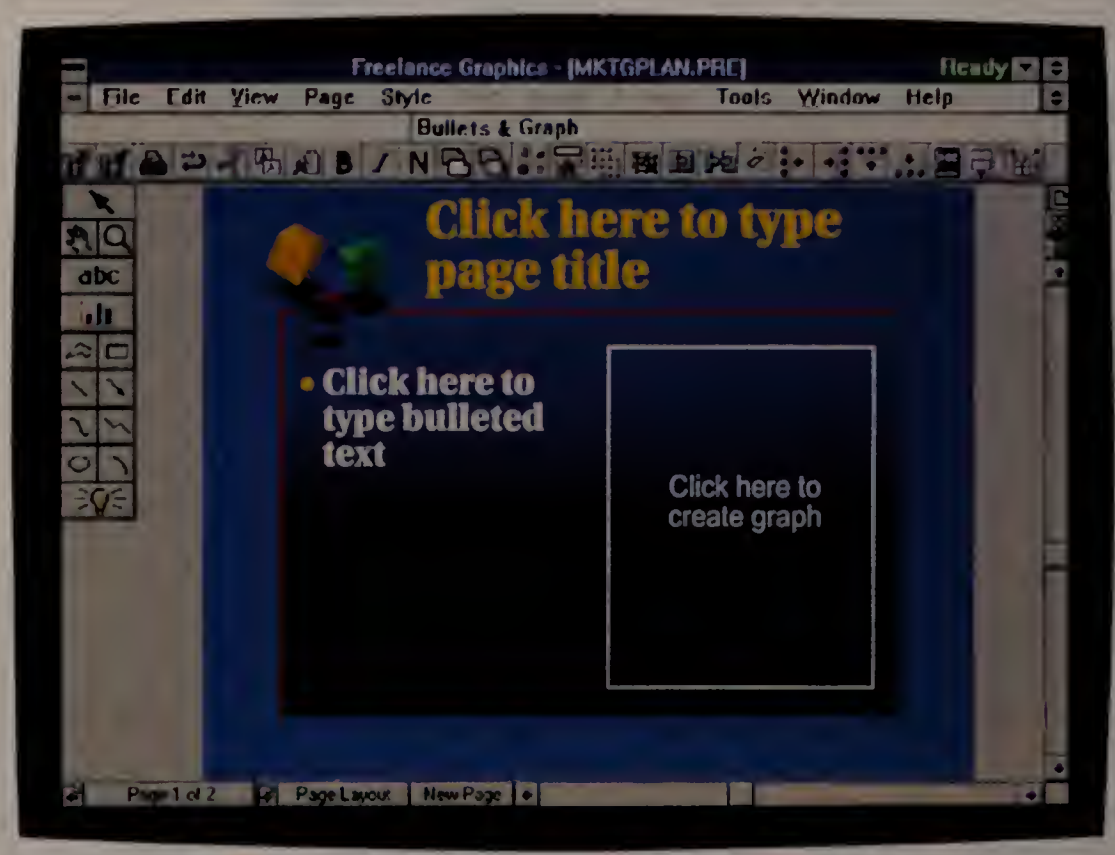

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What's more, a recent study conducted by the Usability Sciences Corporation found

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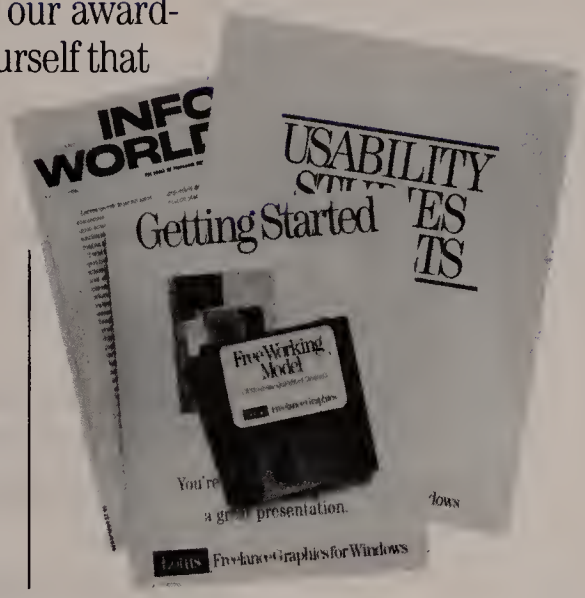

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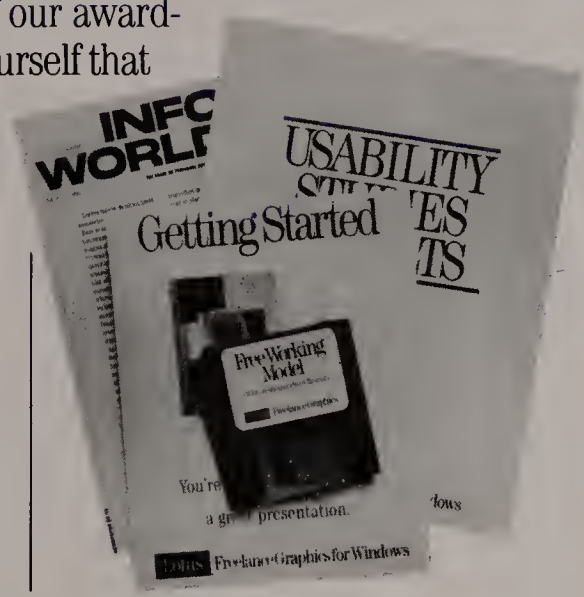

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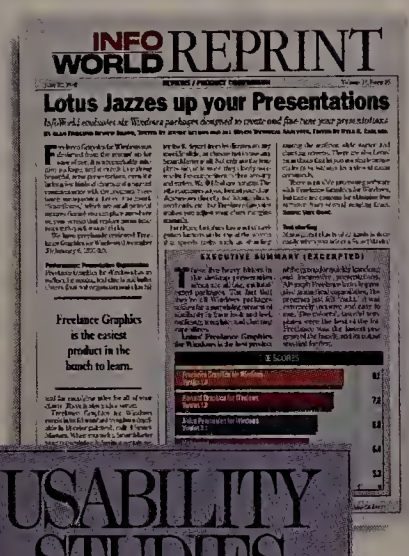

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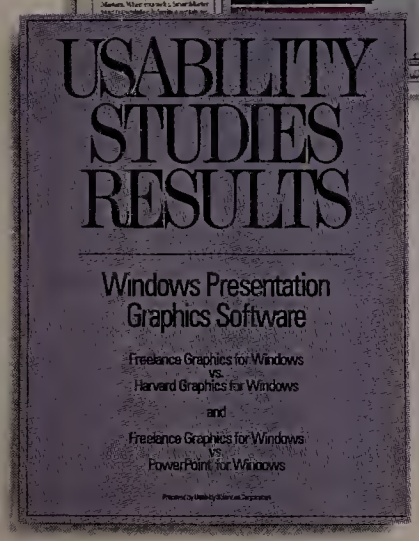

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IBM GETS AGGRESSIVE

It's déjà Blue again as IBM recasts its midrange line and launches another fleet of inexpensive PCs. Or is it? After reorganizing, IBM's not the same old Big Blue.

Is the elephant finally tap-dancing? For the first time in about six years, IBM is offering a product line that's competitive in features and price in every flavor of desktop and portable PC. And now you can buy Blue any which way you want—even through the mail.

The flood of new products—11 systems in more than 20 configurations, not including new PS/1s and servers—has been ongoing since early September. It coincides with yet another reorganization of IBM's PC product group, which is now operating as an independent business—the IBM Personal Computer Company. By the time IBM product managers finish the unveiling, the business PC product line will segment into two principal groups: the PS/2 line, composed largely of enhanced versions of current PS/2s, and the ValuePoint line, a newly designed trio of entry-level AT bus machines.

The PS/ValuePoint family targets business users who look for a reasonable mix of power and features and then shop around for a good price—the very folks keeping Compaq ProLineas on back order. Each of the

Above, the PS/2 Model 56 is joined by the ThinkPad 700C, part of the IBM PC Company's revamped product line.

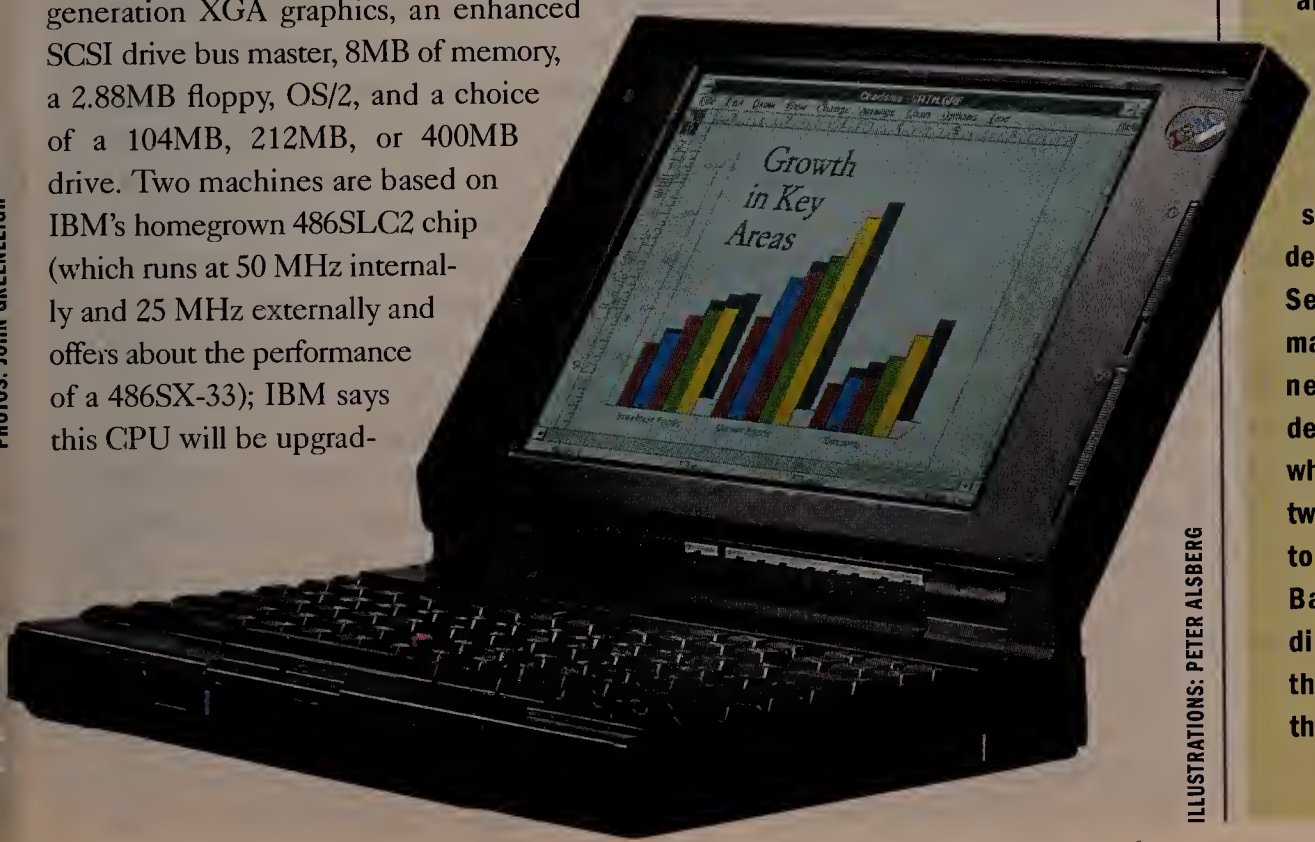
Edited by Russell Glitman and Eric Bender

WITH NEW PCs

three ValuePoints comes with five open ISA (rather than Micro Channel) slots, three open drive bays, and a mouse. The machines will also come with either a 15- or a 14-inch SVGA monitor with .28mm dot pitch. The Model 325T, based on IBM's homegrown 386SLC/25 processor, includes Cirrus super-VGA graphics, 4MB of memory, and DOS preloaded. While prices were not final at press time, IBM intends to price the ValuePoints $20 to $200 above Compaq's ProLineas, which do not include monitors. Street price should be about $1000 for the 325T with an 80MB hard drive. A 170MB drive is also available. The 486SX-25–based Model 425SX and 486DX-33–based Model 433 both include faster Tseng ET4000 graphics, 8MB of memory, and OS/2 preloaded. The Model 425SX is offered with either an 80MB drive or a 170MB drive, while the Model 433 comes with either a 170MB drive or a 213MB drive. All will be sold through dealers and via IBM's new direct-response number.

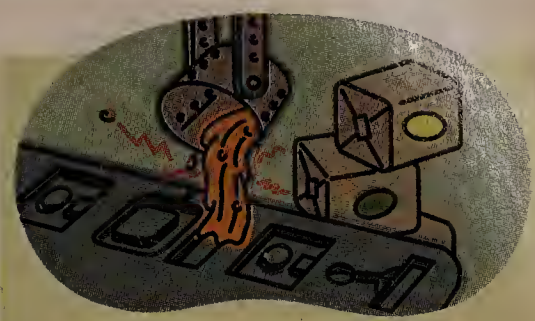
IBM's PS/2 line gets five new midrange models. Each one is equipped with second-generation XGA graphics, an enhanced SCSI drive bus master, 8MB of memory, a 2.88MB floppy, OS/2, and a choice of a 104MB, 212MB, or 400MB drive. Two machines are based on IBM's homegrown 486SLC2 chip (which runs at 50 MHz internally and 25 MHz externally and offers about the performance of a 486SX-33); IBM says this CPU will be upgradable but won't give product details. The Model 56 comes with three slots and one bay open and lists for $2265 with a 104MB drive. The Model 57 features five slots and two bays open and is priced at $2855 with a 212MB drive. There are two 486SX-33 offerings: The Model 76 comes with two slots and one bay open and costs $2735 with a 104MB drive; the PS/2 77 features four slots and two bays open and costs $3320 with a 212MB drive. A version of the PS/2 77 with a 400MB hard drive is $4065. Both 486SX-33s will take a CPU upgrade via a daughtercard. Finally, the Model 77 486DX2-66 system has four slots and two bays open and a price tag of $3935. A version with a 400MB drive is $4680. Among the options for the PS/2 line is a floppy drive that ejects disks automatically like a Macintosh. IBM also bundles three-year on-site service with four-hour average response time anywhere in the United States—no small benefit.

XGA-2 becomes a credible graphics alternative with support for noninterlaced displays at 1024 by 768 resolution, 800 by 600



PHOTOS: JOHN GREENLEAF

ILLUSTRATIONS: PETER ALSBERG



News Monitor

DOS 6.0 BETA: Microsoft has struck licensing deals with leading utility vendors and will include some of their products' key features in MS-DOS 6.0, according to sources close to the company. The goal: to enhance DOS's memory management and backup capabilities, arm users against virus attacks, and provide essential tools for defragging disks. DOS 6.0 will also offer additional memory optimization tools, compression integrated into the kernel, and tighter network and *Windows* integration than previous versions. Also look for *Windows* versions of some of the key tools in DOS 6.0. The first beta of DOS 6.0 went to users in August, and the product is expected to ship in the first quarter of 1993.

PROLINEA BACKLOG: Customers report a two-to-three-month backlog of orders for the new ProLinea line of low-cost "clone busters" from Compaq, and no one is happy about the shortage. Washington D.C. attorney Tom Serevino ordered—and paid for—a 486-33 in mid-July and was told he'd get his new computer in seven to ten days. After repeated delays he finally requested a refund in September. "I'm sure it's a good machine," says Serevino, who feels he never got the straight story from his dealer. "People are going to look elsewhere if they're going to have to wait two months for their computer and are told stories that aren't true." Bob Bauer, Compaq's North American director of desktop marketing, says the company was caught off guard by the popularity of the ProLinea family.

(continued on page 45)

SVGA support, photo-realistic 16-bit full-color images (with 65,536 simultaneous colors) in multiple windows in VGA or SVGA mode, 256 colors from a 16.8 million color palette at 1024 by 768, and performance up to twice as fast as the original XGA. IBM's tests show it faster than Compaq's QVision on mixed DOS and *Windows* applications.

On the portable front, IBM has consolidated all its notebooks as the ThinkPad family. The headliner is the 25-MHz 486SLC Model 700C notebook, which provides a bright, crisp, 10.4-inch active-matrix color screen, a floppy drive in front, an easily removable 120MB hard drive, and 4MB of memory expandable to 16MB. It also comes with an IBM-designed Trackpoint pointing device—a pressure-sensitive directional button embedded in the center of the keyboard, with accompanying selection buttons placed below the space bar. The 700C weighs 7.6 pounds with battery pack and runs for 2 hours of continuous use. You can upgrade to a 25/50-MHz CPU (via dealer) or a 160MB drive. The 6½-pound Model 700 monochrome version with 80MB drive runs for almost 4 hours of continuous use; you can upgrade its hard disk, CPU, and screen. The entry-level 300 is a 25-MHz 386SL that weighs 5.9 pounds and comes with an 80MB hard drive. IBM is also offering a two-slot, one-bay docking station. Prices for all these products were not available at press time.

A revamped line of PS/1s still targets home and home-office users, arrives with bundled applications, and sells through mass merchants, but these new desktops are designed for serious work rather than use as game machines or information appliances. They have shed the integrated monitor design and look similar to ValuePoints under the cover. Pricing will be set by retailers but should begin at $1200 for a 386SX-25 system. Finally, at the other end of the spectrum, IBM has filled in the gaps among its network servers with high-performance disk arrays storing up to 57GB.

With the exception of an existing notebook, IBM is designing and building everything across this gamut—no small feat when many rivals, such as Dell, are hiring outside suppliers to do the job. In-house manufacturing and quality testing, plus IBM's service-and-support strengths, should make customers comfortable. If IBM can maintain its aggressive pricing, Big Blue will once again have an attractive product line.

—Eric Bender

The PS/ValuePoint: IBM's newest product line goes head-to-head with Compaq's ProLinea.

Can IBM Really Dance?

ANALYSIS ▶ ***PC World*** **has been choosing Best Buys for four-and-a-half years, and in all that time, an IBM machine was selected only once (it was the portable PS/2 Model P70 386 in the September 1989 issue). This is not exactly an impressive record for the world's largest PC company. The same themes cropped up in review after review: high price, mediocre performance, and mundane features.**

Now IBM has reorganized its PC business into the new IBM Personal Computer Company, which brings product design, manufacturing, and marketing into one group for the first time. The PC Company is organized by product brand; each unit has a set of target customers and has been given permission to buy components from inside and outside IBM. The theme: lean, mean, and fast. At the same time, the PC Company has launched a direct-response sales group that should get up to speed next year, building to order whatever you want.

In short, IBM is planning to act like just about every other PC player in this rough-and-tumble market.

You may ask, why did it take so long? You also may note the reorganization left mostly the same executives running the show. While a huge game of musical chairs is under way for the employees beneath them, IBM insists it has not laid off any of its 10,000 workers, though sales did drop this year. And you might ask why IBM's core development group for PC components, the year-old Entry Systems Technology group, was not rolled into the PC Company.

But the key question is whether there's been a genuine change in the IBM culture. Often the company has seemed bent on producing the world's most impressive collection of internal business memos rather than actually seizing opportunities. Often IBM product managers have concentrated on the vast area covered by Big Blue and its customers and remained astonishingly uninformed about the far vaster turf outside. And often a collection of very smart people have dreamed up grand multiyear (sometimes multidecade) strategies and then ignored the problem of timely execution.

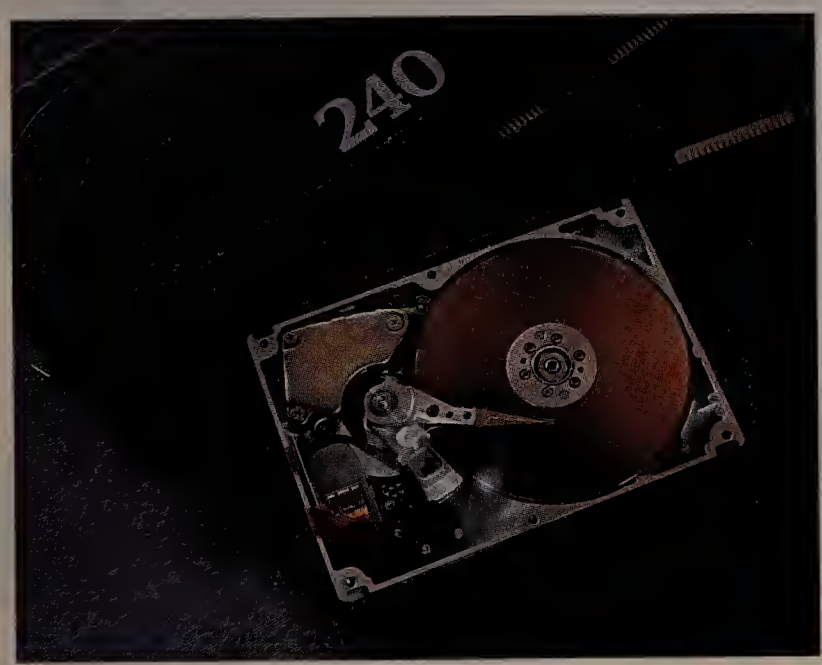
But if all that changes, if IBM really does start behaving more like its competitors while retaining its traditional strengths, the company can make a serious bid to win back customers who fled to Compaq, Dell, Gateway, or others. That competition will be good for anyone buying a PC. —*E. B.*

In all the ink we give IBM, something's missing—a recommendation that you actually buy IBM systems.

JOHN GREENLEIGH

240MB Quantum Hardcard EZ

TEST DRIVE Storage bays are at a premium in today's downsized desktop PCs. But modern operating systems, environments, and applications are eating megabytes like there's no tomorrow. Don't be surprised if you find yourself needing more storage capacity but having no extra bay to berth an additional hard disk. So what's the easiest way to get more megabytes?



The Hardcard EZ 240 is a 240MB hard disk on an expansion card.

The original no-brainer hard disk upgrade was Plus Development's Hardcard—a nifty device that required no storage bay, installing quickly and easily in a free expansion slot. The latest Hardcard EZ incarnation comes in four capacities: 42MB, 85MB, 127MB, and 240MB. This hard disk is no tortoise: The 240MB model has a quick 16ms average seek time, and in everyday use it's as speedy as any IDE hard disk around. That makes it a logical choice for running *Windows* or any application.

If you're worried about compatibility and hard disk problems, Quantum has you covered. The company projects a mean time between failures of 250,000 hours, and it warrants the product for a full two years. If during that time you need your Hardcard EZ repaired or replaced, Quantum will renew your warranty for another two years. On top of that, the company also offers a money-back guarantee of compatibility with all non–Micro Channel 286, 386, and 486 systems along with any drive you may already have in your PC.

If you've never added a Hardcard to a system, you'll be pleasantly surprised at its ease of installation. You just insert the unit in an empty 8/16-bit expansion slot, tighten the slot-cover screw, and run the installation. Quantum isn't fudging on its prediction of 10 minutes to install this Hardcard. Upgrade veterans may get the job done in half that time.

With a $749 list price for the 240MB model, the Hardcard EZ is competitive with conventional IDE models. If you're out of bays and need to boost storage, the Hardcard EZ may be your only practical option. If you have a spare bay, the Hardcard EZ's competitive pricing, great warranty, compatibility guarantee, and easy installation make it a logical alternative to other hard disks.

—Rex Farrance

Quantum Hardcard EZ

The Hardcard EZ features a 240MB top capacity and an aggressive price.

Key Features

- **42MB, 85MB, 127MB, or 240MB**
- **Coexists with any hard disk**
- **Two-year renewable warranty**

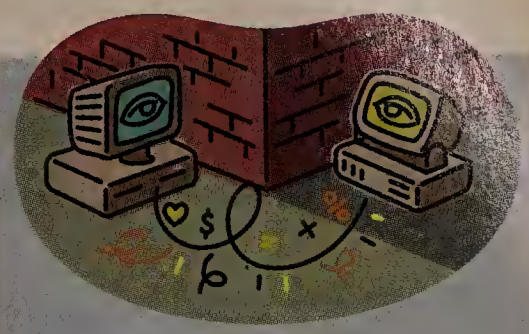
Availability

Immediate

Pricing

Hardcard EZ 42 $269, EZ 85 $369, EZ 127 $449, EZ 240 $749

Quantum Corp.
800/624-5545, 408/894-4000
Reader service no. 751



News Monitor

(continued from page 43)

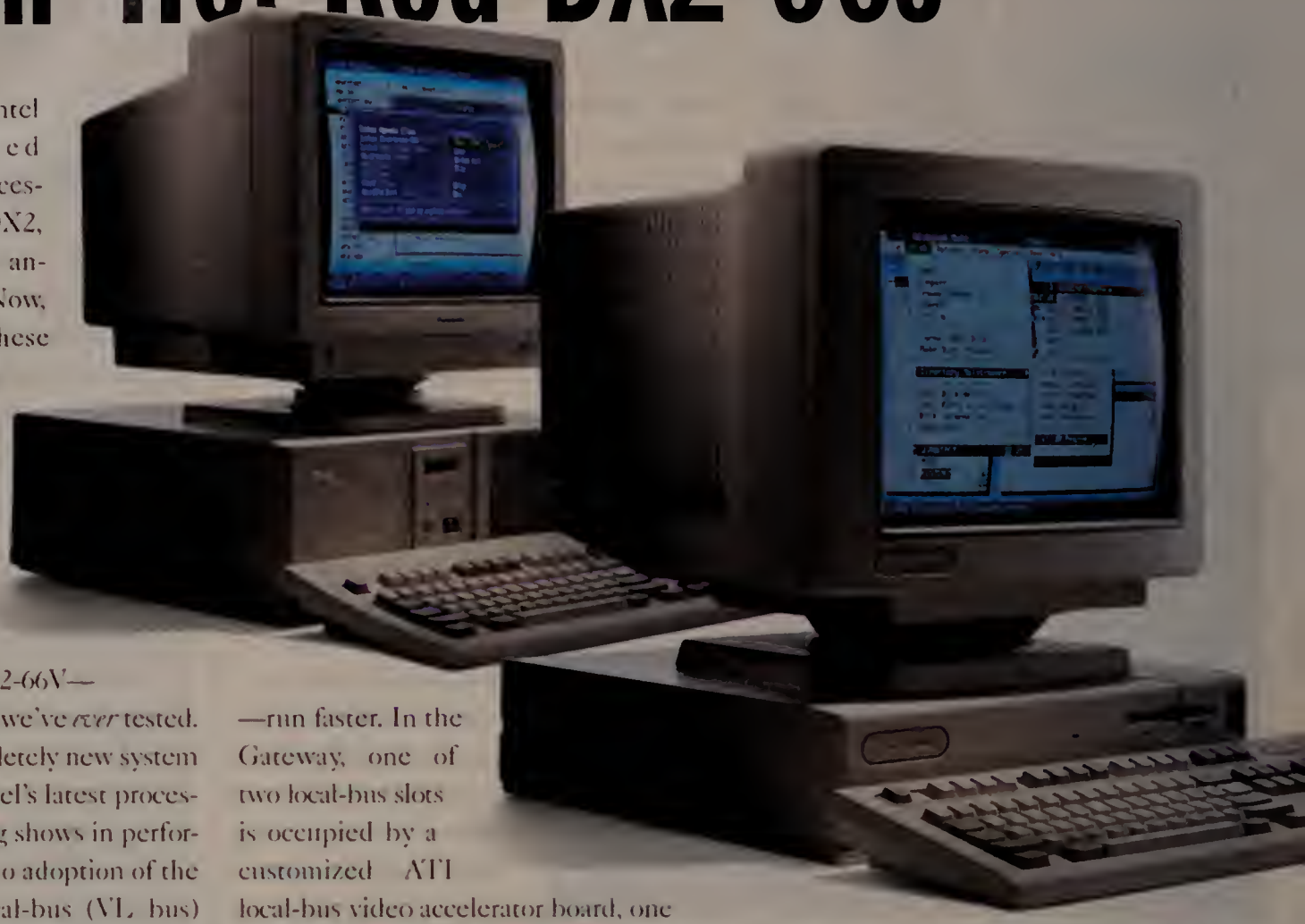
Seven manufacturing lines are working around the clock to catch up, and Bauer expects to meet demand for most ProLinea products in October. Shortages of some models may continue through the end of the year.

WINFAX PRO 3.0: Delrina Technology is launching a feature-packed upgrade of its market-leading *WinFax Pro*. The Toronto-based company has included image annotation tools for adding text, circles, boxes, squares, and sketches to received faxes. Users can employ the *dBASE* file format to store phone book information. *WinFax Pro 3.0* incorporates Caere's new AnyFax optical character recognition (OCR) technology, also found in Caere's *FaxMaster* fax software, that's optimized to recognize text on standard faxes. It also features antialiasing technology to clean up random lines and smudges that often appear on incoming faxes. Users can place graphics and phone book fields anywhere on the cover page. *WinFax Pro 3.0*'s introductory price is $129; current *WinFax Pro* and *DosFax Pro* users can upgrade for $49.

IN YOUR (CPU) PLACE: Processor clone maker Cyrix is hot on Intel's heels again, this time with two families of upgrade microprocessors—the first boosts Intel 386DX systems to 486SX-level performance, the second offers twice the internal clock speed of 16-MHz and 20-MHz 486SX chips. The first CPU family—code-named DRu—ups 386DX-25 and 386DX-33 system performance by about 35 percent,

(continued on page 47)

Smokin' Hot-Rod DX2-66s



TEST DRIVE After Intel debuted its latest high-octane processor, the 66-MHz 486DX2, over 25 system vendors announced support for it. Now, just a few months later, these vendors are coming to market with a wave of speedy machines. Judging by the first 66s to survive our performance tests, these systems smoke.

Leading the pack is Gateway's 486DX2-66V—by far the fastest machine we've *ever* tested. This dragster uses a completely new system board design as befits Intel's latest processor. The slick engineering shows in performance, due in large part to adoption of the new VESA-standard local-bus (VL bus) slots. In fact, the Gateway 486DX2-66V is one of the first systems on the market to be so equipped and no doubt will be a benchmark for competitors. Since the local bus runs at the same speed as the system clock instead of the ISA bus's 8 MHz, peripherals—and, as a result, the system as a whole—run faster. In the Gateway, one of two local-bus slots is occupied by a customized ATI local-bus video accelerator board, one of the first graphics controllers we've seen that is specifically designed for this fast new VESA connection standard.

Performance Specifics

Superlatives aside, just how much faster is Gateway's local-bus and DX2-66 combo? When compared with the average DX2-50 from our October review, the Gateway is a full *60 percent* faster overall. For example, thanks in large part to its local-bus graphics, the Gateway took just 38 seconds to finish our graphics-intensive *Windows* test, while the average DX2-50 needed 53.

OverDrive Your 486DX Systems

A select list of 486DX-25 and 486DX-33 systems upgradable to 50 MHz and 66 MHz, respectively, with Intel's new OverDrive chip.

Manufacturer	Model	Speed (MHz)
Acer	AcerFrame 3000MP	33
	AcerPower 486e	33
American Mitac	4280G	33
Amkly Systems	486/25E	25
	486/33E	25
AST	Bravo 4/25s	25
Compaq	Deskpro 4/33I	33
	Deskpro 486/33L	33
	Deskpro 486/33M	33
	ProLinea 4/33	33
	Systempro LT 486/33	33
	Systempro 486/33	33
CompuAdd	433EISA	33
	CompuAdd 433	33
DEC	DECpc 433 Workstation	33
Everex	Step 486	25
	StepServer 486/33	33
Gateway 2000	486DX-33	33
Grid Systems	486EI-25	25
Hyundai	Corporate Series	33
Leading Edge	Model D4/33	33
NEC	BusinessMate 486/25E	25
	PowerMate 486/33e	33
Northgate	Elegance ZXP 486/33	33
Samsung	SystemMaster 486/25TE	25
Tandy	Tandy 4833 LX/T	33
Tatung	TCS-9000/T	25
Wyse Technology	Decision 486/25	25
Zenith Data Systems	Z-486/25E	25
Zeos Int'l	486DX/33	33

The above U.S. products are certified by Intel as compatible with the new OverDrive processor. If your machine is not listed, contact your vendor for further information.

Intel claims OverDrive chips boost performance up to 70 percent. The OverDrives for 486DX-33s list for $799; for 486DX-25s, they're $599.

Compaq, Dell, and Gateway are just a few of the many vendors rushing 66-MHz 486DX2 systems to market.

Unlike Gateway, however, most vendors will ship their 66-MHz systems using existing 33-MHz motherboards with only some minor tweaks (the BIOS has to be rewritten, and the case may require improved ventilation). Compaq, for one, wasted little time in releasing a 66-MHz version of the new Deskpro/i desktop system. Like the other Deskpro/i's, this system comes with QVision graphics, built-in Business Audio, and 4MB of RAM in a slimline case, but no monitor. While the Compaq isn't as fast on our benchmarks as the Gateway, it's still faster than the average DX2-50, especially on our disk-intensive *dBASE* and processor-intensive *1-2-3* tests.

Speed isn't all you get with DX2-66 systems—they should also deliver this unprecedented performance for remarkably reasonable prices. The 486/DX2-66 WinStation from Austin, for example, which was neck and neck with the Compaq on most of our tests, gives you a 210MB hard drive and 4MB of RAM for just $2790; a VESA local-bus version will also be available for $3290. Dell's new System 486D/66, which fell about halfway between the Gateway and the Compaq on our performance tests, was the highest-priced system we tested: With a 230MB hard drive, 4MB of RAM, six expansion slots, accelerated graphics integrated on the motherboard, and monitor, the system sells direct for $3149. If you need warp speed and full-bore performance, the choice is simple—486DX2-66.

—Dan Miller

Austin 486/DX2-66 WinStation
Direct price: with 210MB hard drive, 4MB RAM $2790
Austin Computer Systems
800/752-1577, 512/454-1357
Reader service no. 752

Compaq Deskpro 4/66i
List price: with QVision, Business Audio, 120MB hard drive, 4MB RAM $2749
Compaq Computer Corp.
800/345-1518, 713/378-8820
Reader service no. 753

Dell System 486D/66
Direct price: with 230MB hard drive, VGA monitor, 4MB RAM $3149
Dell Computer Corp.
800/289-3355, 512/338-4400
Reader service no. 754

Gateway 486DX2-66V
Direct price: with ATI local-bus graphics accelerator, VGA monitor, 340MB hard drive, 8MB RAM $2995
Gateway 2000
800/523-2000, 605/232-2000
Reader service no. 755

News Monitor

(continued from page 45)

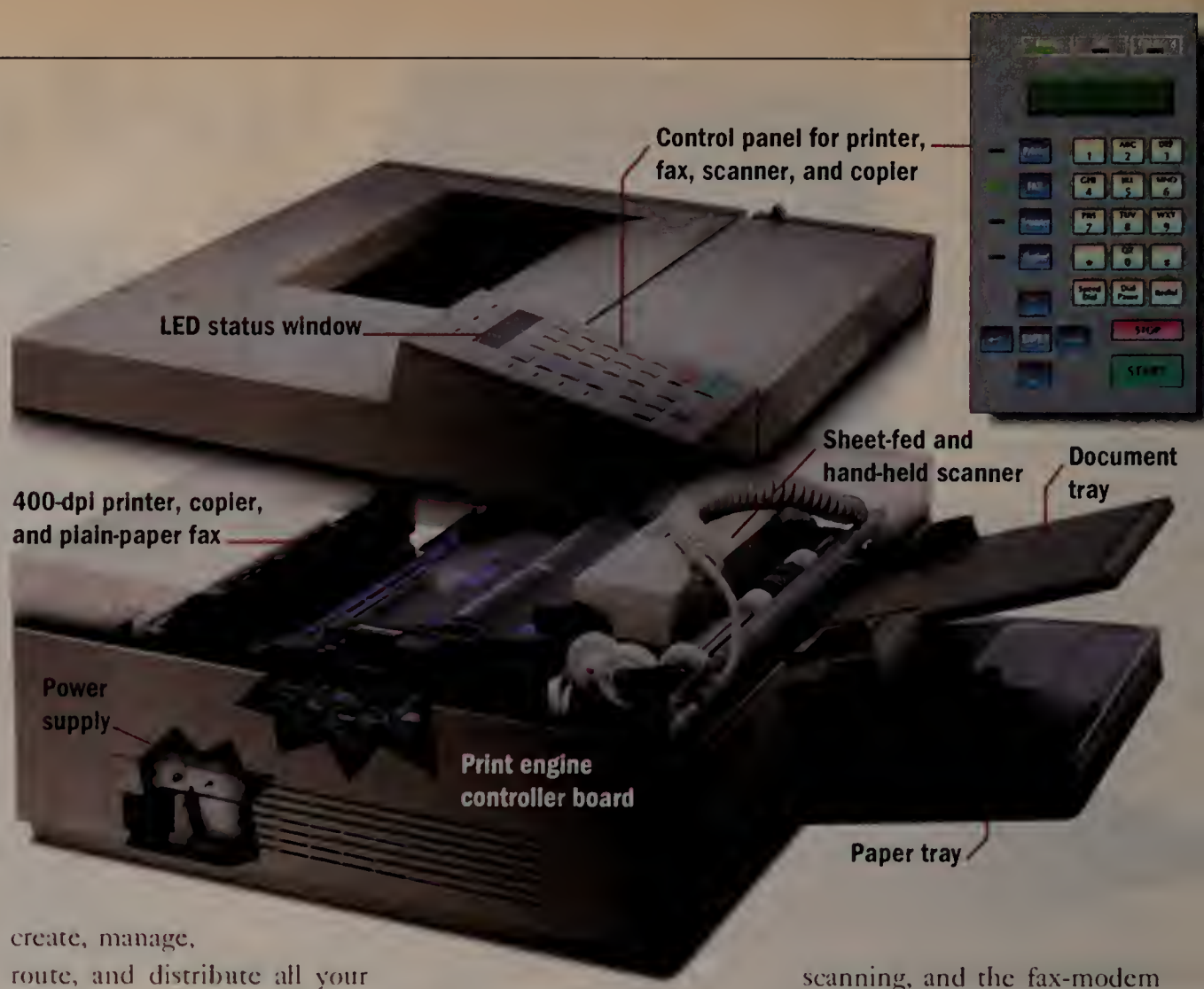
Cyrix claims, and should list for $299 per chip. Cyrix also will have $399 16- and 20-MHz 486SX-equivalent clock doubler upgrades—code-named DRu2. They run internally at 32 MHz and 40 MHz respectively, improving system performance an average of 65 percent. Buyers can continue to use their 387 math coprocessors or buy a new Cyrix FastMath. Cyrix plans to extend its line again in November with enhanced-performance CPUs designed to fit into Intel 486DX and 486SX sockets much as its Cx486DLCs and Cx486SLCs fit into 386DX and 386SX sockets.

CHIP-A-RAMA: Fighting back, the two other premier U.S. PC chip makers have new offerings—a 40-MHz 386SX clone from Advanced Micro Devices and a 33-MHz version of Intel's 486SX. With AMD's 486 product plans sidetracked by the courts, the company hopes the Am386SX-40 will coax a few more miles from the large 386 installed base, while Intel continues to try to move buyers upward with what is likely to become the new low end of 486SX system choices. AST, Dell, and Zenith are among vendors announcing entry-level 486SX-33 systems for about $1900. With more varieties of microprocessors available than Baskin-Robbins has flavors, Intel is working on a comparison chart of its processor line planned for winter release. The chart ranks processors by a new benchmark that Intel calls iCOMP units. Under this scheme, a 486SX-25 scores a 100; the new 486SX-33 is a 136.

—Jeff Bertolucci, Roberta Furger, Russell Glitman, and Mike Hogan

PHOTOS: JOHN GREENLEIGH

Print It, Fax It, Scan It, Copy It



PHOTOS: JOHN GREENIGH-NAGAM, JEFF BERRY

TEST DRIVE Except for meeting at the watercooler, sharing office equipment can be a real drag. Joint access to printers, fax machines, and copiers usually spells frustration—especially when timeliness and confidentiality are vital to your work. If only you had the budget and desktop space to set up and use your own equipment.

If that's your predicament, Okidata's new Doc-It system may be just what you've been waiting for. This innovative multifunction peripheral is Okidata's answer to the daily triathlon of inputting, outputting, and communicating information. By combining four key office functions—printing, faxing, copying, and scanning—in a single software-controlled system, Doc-It provides an effective all-purpose solution to create, manage, route, and distribute all your documents. Best of all, Doc-It requires less desktop real estate and costs less than the equivalent stand-alone units.

The main Doc-It unit, which Okidata calls a desktop document processor (DDP), is essentially a standard LED laser printer that weighs 36 pounds and has a compact 17½-by-22½-inch footprint. The print engine handles copying and printing and includes PostScript-compatible TrueImage, PCL, and Epson LQ printing emulations.

Also inside the unit is a removable sheet-fed scanner (with a 2-foot umbilical cord) that can be used as a hand-held device—to scan a photograph or a page from a book, for example.

The DDP unit is driven by a controller fax-modem board, which takes a full-size 16-bit slot in a PC with at least 2MB of RAM and 10MB of free disk space. The controller contains a powerful Intel 32-bit i960 RISC processor for fast printing and scanning, and the fax-modem runs at 9600 bps.

We tested the $4999 Doc-It 4000, which features 400-dpi printing, scanning, and faxing and includes a full set of 35 PostScript-compatible TrueType fonts. Of course, the recipient of your fax will also need a Doc-It 4000 in order to receive a 400-dpi fax. For $1000 less, Okidata offers Doc-It 3000, a 300-dpi version that comes with 13 TrueType fonts. Both systems include a single 200-sheet letter-size paper tray and a 30-sheet document feeder for the scanner.

Although the Doc-It DDP has a front control panel for walk-up faxing and copying, the *Windows*-based Doc-It Manager software provides all the tools you'll need to create, print, and fax documents directly from your desktop. As you'd expect, you can specify time and date for your fax transmissions, attach logos and cover sheets, maintain phone books and activity logs, and view and print stored faxes. You also get built-in image editing tools with which you can easily copy and

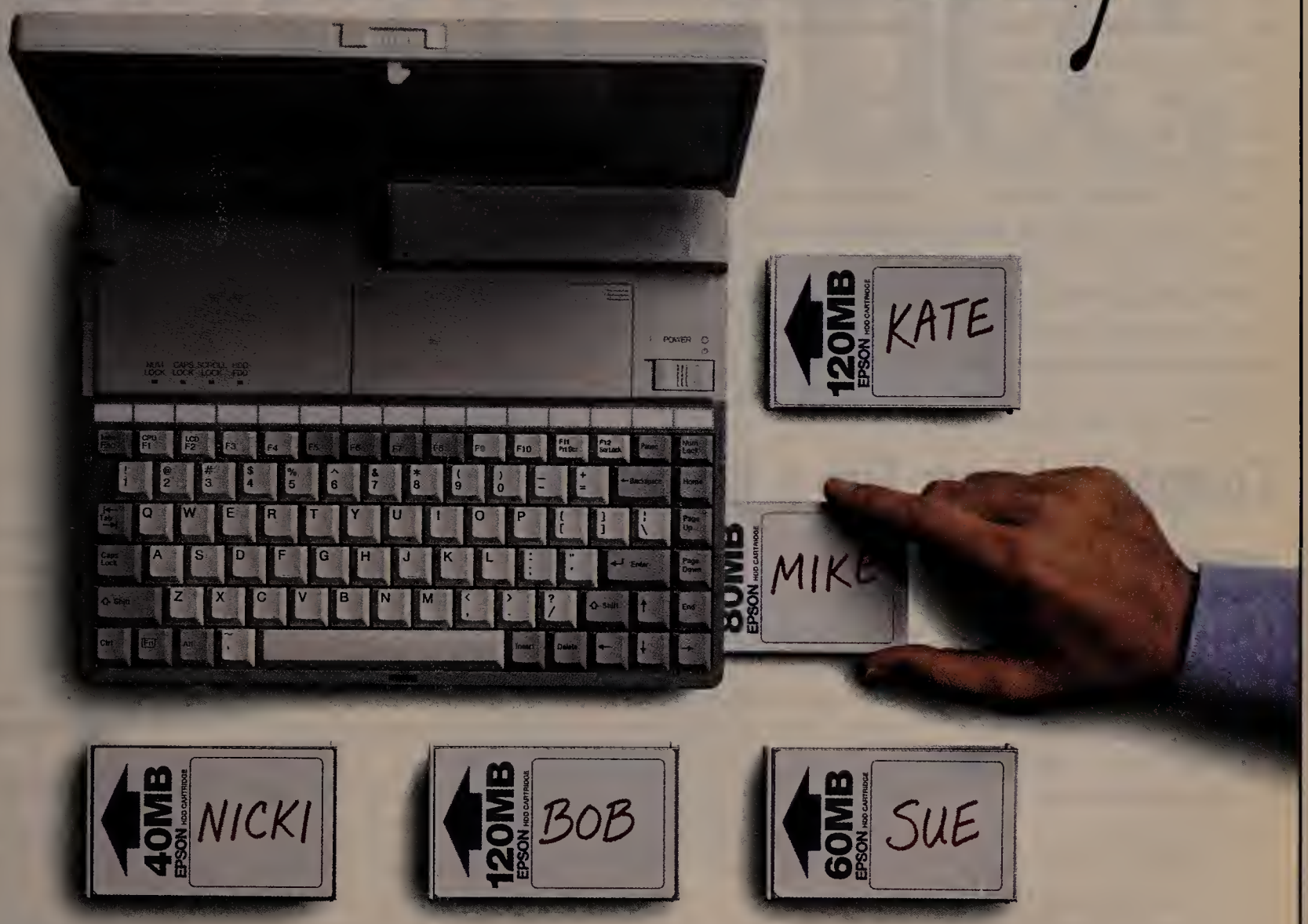
An Office on Your Desk

Product	List price	Weight (lbs.)	Footprint (inches)	Lifetime (years)
Doc-It 4000	**$4999**	**36**	**394 square inches**	**5**
Alternative Peripherals				
TI microLaser Turbo	$1749	33	14.2 x 13.4	5
Canon PC-2LX Convenience Copier	$1095	26.2	12 x 16	5
HP Fax-310	$1999	26	20 x 15	5
Intel SatisFaxtion Modem/400	$499	n/a	n/a	3*
Eclipse Fax	$119	n/a	n/a	n/a
Canon IX-30F Image Scanner	$1545	16.5	18.75 x 13.5	5
Canon IX-ADF Automatic Document Feeder	$595	6.6	18.25 x 13.5	5
The Complete PC Half-Page Scanner/GS	$349	1	5.5 x 5.25	5
Total	**$7950**	**109.3**	**1211 square inches**	

*Warranty.

At roughly one-third the weight and one-third the footprint, Okidata's Doc-It saves money and space.

Seats Five Comfortably.



You can't fit five hard-working people into just any notebook computer. But the Epson® NB-SL™ line features a unique, removable, pocket-size hard drive that's loaded with possibilities. So now, armed with their own removable drives, any number of users can share one NB-SL without sharing data.

What's more, these drives are extremely easy to transport or lock away for extra security. You can even create a library of drives, each with its own type of information. Or, add an optional adapter and plug your drive directly into your desktop computer.

To find out more about the NB-SL, call **800-289-3776** for our free demo diskette, and the name of your nearby Epson dealer. Then round up three or four friends and come in for a test drive.

EPSON

Desktops

Dot Matrix

Notebooks

Lasers

Servers

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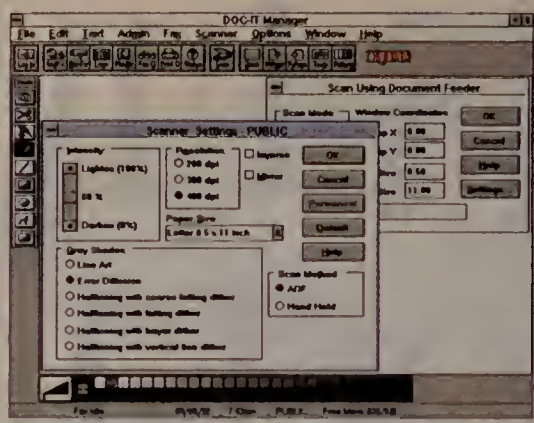
Continued from page 48

paste text or images from one open fax document to another.

As handy as its image-editing tools are, I'd like Doc-It Manager more if it had an undo or revert-to-saved feature—both of which are missing from the beta version *PC World* tested. For example, if you accidentally erase part of a document, you have to close and reopen the file. Another feature I'd like to see is the capability to delete an entire page, such as a cover sheet, from an incoming fax, which would make it easier to resend it to another location.

When you do want to print documents, Doc-It Manager provides two options: standard printing using *Windows'* Print Manager or direct printing via Okidata's own Doc-It Port Manager, which is considerably faster. You can also tell Doc-It Manager to print and fax a document simultaneously while you work on other applications.



Doc-It Manager's icon-laden Windows Interface lets you print and fax documents without leaving your desktop.

Only time will tell if the Doc-It DDP system catches on and sets a standard for personal peripheral combos. To succeed, Okidata must assure consumers that if one Doc-It function breaks down, they can still use the other features. But as Monty Teague, Okidata's senior product manager, points out, "Doc-It Manager allows key system functions to operate *independently*, which is not true of most multifunction devices. If the scanner fails, you can still run applications, print hard copy, and electronically send and receive faxes."

As a one-stop input/output solution, Doc-It should appeal to business users and managers who want to organize, route, and manage all their documents from their desktop.

—Richard Jantz

Okidata Doc-It 4000

A compact, well-designed peripheral that combines a 400-dpi Trueimage printer, electronic and walk-up fax, a personal copier, and a scanner.

Key Features

- **400-dpi fax**
- **8-ppm laser printer**
- **10-ppm sheet-fed scanner, hand-held scan unit**
- **Personal copier**
- **Document manager**

Availability

Immediate

Pricing

Doc-It 4000 $4999, Doc-It 3000 $3999

Okidata Corp.
800/654-3282
Reader service no. 740

Compaq's Lasers Fire a Bolt at HP Printers

TEST DRIVE

Compaq's aggressively priced, speedy network laser printers, the Pagemarq 20 and the Pagemarq 15, go toner-to-toner with Hewlett-Packard.

These tough contenders offer duty cycles of 50,000 pages per month, and their Fuji Xerox printer engines take a beating and still produce good-looking output, thanks to a resolution of 800 by 400 dots per inch (dpi). *PC World*'s resident experts judged output quality to be better than that of the HP LaserJet IIISi and equal to that of the high-resolution 600-dpi printers.

Adobe Systems' new PostScript Level 2 is the native mode of the two Pagemarq printers, which have 35 resident PostScript typefaces. Though the printers have an HP LaserJet III–compatible PCL 5 mode, it's limited to 300-by-300-dpi output and has only 8 scalable typefaces.

Compaq's Pagemarqs 15 and 20 give Hewlett-Packard competition.

Performance tests show that the Compaq Pagemarq 20 makes short work of long documents and lengthy network job queues. Compaq claims the printers are twice as fast as the HP LaserJet IIISi when printing complex PostScript files. Indeed, with ratings of 20 MHz and 16 MHz, the Pagemarq 20's and Pagemarq 15's AMD 29000 RISC processors crunch graphics significantly faster than the HP LaserJet IIISi's 12-MHz AMD 29000 processor.

Network Savvy

The Pagemarqs are suited to network use. Compaq's optional network interface card speeds data to the printer and eliminates the need for a print server.

The Pagemarqs are also the first printers we've tested to offer true emulation sensing, or automatic language switching, a network essential.

There are great options, too, including a 250-sheet 11-by-17-inch paper tray and an internal fax-modem. The Compaq Pagemarqs 20 and 15 are two extraordinary contenders.

—Daniel Miles Kehoe

Compaq Pagemarq 20, 15

Network laser printers deliver speed, innovation, and value.

Key Features

- **20-ppm and 15-ppm**
- **800-by-400-dpi resolution, PostScript Level 2**
- **Optional 11-by-17-inch paper handling and fax**

Availability

Immediate

Pricing

Compaq Pagemarq 20 $5499, Compaq Pagemarq 15 $3999

Compaq Computer Corp.
800/345-1518
Reader service no. 741

Travel Insurance.

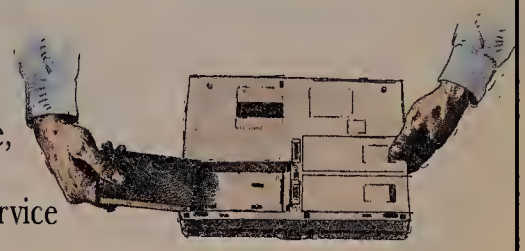
There you are, slaving away in some nondescript motel room in Mobile, Moline or Modesto when your notebook computer suddenly refuses to open the file containing the speech you're giving tomorrow.

You're sunk, right? Not if your notebook is an Epson® NB-SL.™

The NB-SL, you see, comes with Epson's Extra Care Road Service,℠ an innovative support program (free while your notebook is under warranty) that puts expert technical assistance just an 800 number away.

If we can't fix your computer over the phone, we'll overnight you a replacement unit free, anywhere in the United States.

And because the NB-SL features a unique removable hard drive, you won't lose one bit of your precious data—or much precious time—in the process. Simply slide the drive out of the old notebook, pop it into the new unit, and you're ready to go again. It's fast, hassle-free, and won't cost you a cent.



Of course, it's not just service and support that make the NB-SL so superior. For the rest of the story, call **800-289-3776** for our free demo diskette, and the name of the Epson dealer nearest you.

The Epson NB-SL notebook with Extra Care Road Service. You could say it's like having a technical expert with you at every turn.

EPSON

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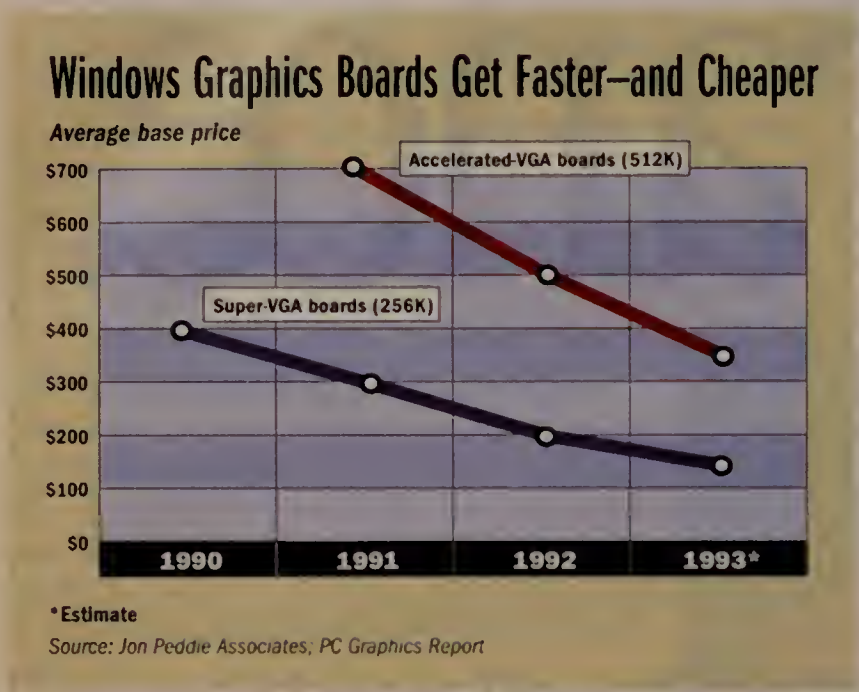
Speeding in Windows Gets Cheaper

The cost of speeding up *Windows* is coming down—dramatically. The reason: new VGA-based video accelerators that provide higher throughput, zero-wait-state operation, better memory management, and more built-in functions.

To help cut costs, most of the new chips work with DRAM rather than the pricier VRAM demanded by older accelerated-VGA controllers and coprocessors. Boca Research in Boca Raton, Florida, introduced a family of boards this summer that offer better performance than the company's previous line at the same price. Built around the Acumos chip set developed by Cirrus Logic, the boards can repaint, draw, and shade figures up to seven times faster than earlier models based on the Tseng ET 4000. "You see a great deal of improvement just going from your spreadsheet to your communications package," notes Kevin Rose of Boca's technical support group.



Accelerated-VGA boards speed Windows application performance using enhanced-VGA controllers (chart excludes coprocessor boards).

As the year draws to a close, list prices for a basic board with 512K of memory are as low as $175. Users who need photographic-quality color imaging can spend $60 more for the top of the Boca line, the SuperX VGA; the board offers 16.8 million colors at 640 by 480 resolution and supports resolutions up to 1280 by 1024.

The $189 Win Vga board from SPEA/Video Seven in Fremont, California, is another vivid indicator of the drop in prices. Using the HT216 graphics controller from Headland Technology, the board offers 1280 by 1024 resolution in noninterlaced mode and provides at least five times the speed of Video Seven's older SVGA board for $110 less.

DRAM-based boards from National Designs, based in Austin, Texas, and Diamond Computer Systems in Sunnyvale, California, also outrun many of the older VRAM adapters for a fraction of their cost.

NDI's Volante Warp10 combines S3 Inc.'s 86C801 graphics chip with an optimized *Windows* driver. The $299 board offers 1152 by 900 and 1024 by 768 resolution; NDI claims the higher resolution will improve the picture on your current monitor. Diamond Computer's SpeedStar 24X employs the Western Digital WD90C31 processor and the company's Turbo Windows driver and delivers up to 15 times the speed of traditional SVGA cards for $249.

Another step up in performance, albeit a step up in price as well, comes from ATI Technologies in Toronto. Its new Graphics Ultra+ offers 65,536 colors at 1024 by 768 resolution with a 76-Hz refresh rate and displays 16.8 million colors at 800 by 600. Not only faster than its popular predecessor, the Graphics Ultra, its $399 price is $80 lower and includes a 4MB buffer that makes smooth animation possible.

In these days of cheaper systems, you can now break the graphics performance bottleneck with a number of bargain-price accelerator boards.

—John H. Mayer

How PCs Will Cut Power Bills:

Desktop PCs that power down to reduce their energy consumption—and your electric bill—will begin appearing next year under the auspices of the U.S. Environmental Protection Agency and several major computer vendors.

Like notebooks that go into sleep mode automatically when not in use, these next-generation desktops promise to conserve power through a variety of methods already developed for mobile computers.

PC makers in the EPA's Energy Star program, which establishes a conservation standard, will produce desktop PCs and monitors that individually draw less than 30 watts of power in sleep mode. Combined, the total is roughly one-third the power consumption of today's systems. And manufacturers seek to give desktop users a choice among power-conservation techniques, similar to the range available in today's advanced notebook PCs.

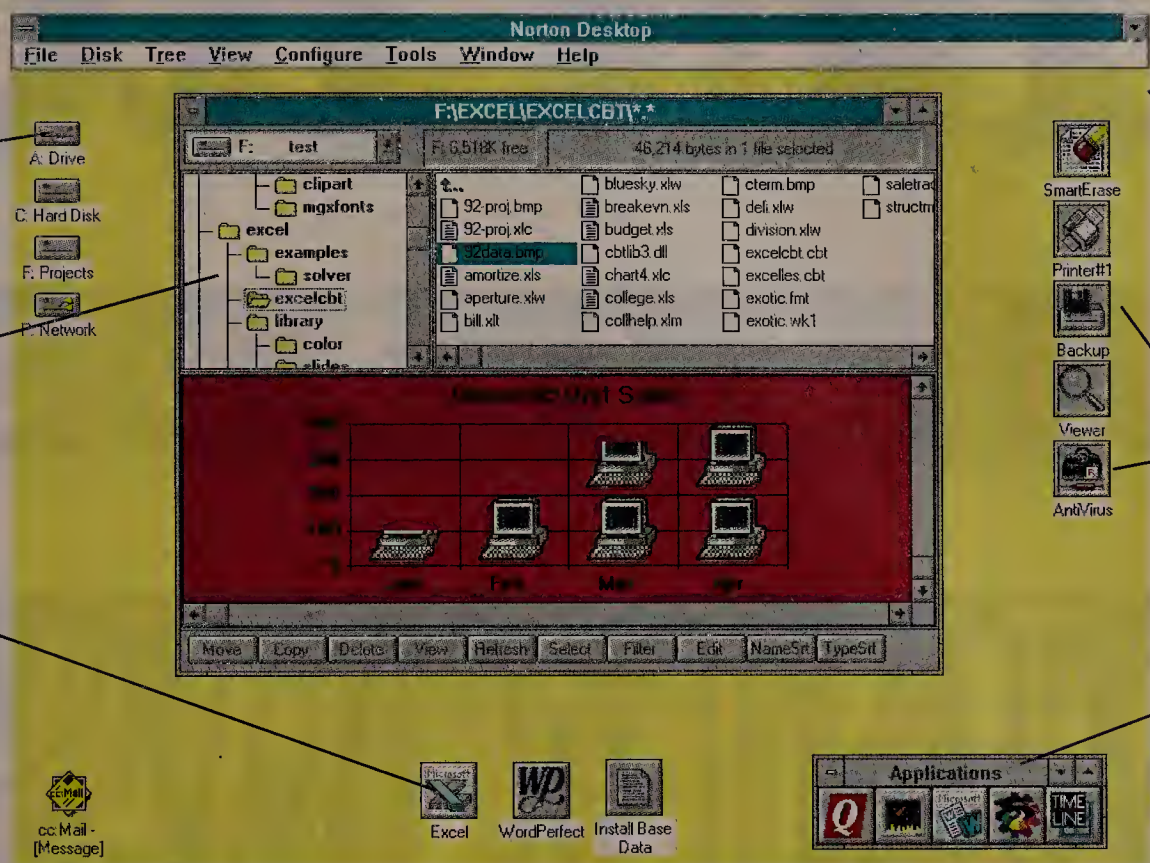
"There are opportunities to save power everywhere we look—the system board, the power supply, the hard drive, and the monitor," says Walt Rosenberg, Compaq Computer's manager of environmental affairs. For example, when your screen saver kicks on, your monitor's appetite for power hasn't changed. Laser printers, copiers, and fax machines also are prime candidates to be put on a power diet, adds Rosenberg.

NORTON DESKTOP FOR WINDOWS SAVES TIME, MONEY, ENERGY, AND DATA.

With Norton Desktop for Windows, your drive icons sit right on the desktop, so you get direct access to your files.

Click on a drive icon for easy file management. The drive window includes a tree pane, file pane, and a customizable button bar with a view option.

For total convenience, applications or files can be dragged onto the desktop for easy access. Open files effortlessly with a quick mouse click or, by dragging the file to the application.



The Norton Desktop is a completely integrated environment. You can drag-and-drop files from the drive window to a tool, drive icon, application, or onto the desktop itself.

All the utilities you need to backup, protect, and repair your data sit right on your desktop. You can drag files or drive icons directly to the tool you need.

Keep your favorite applications in a handy customizable toolbox. Launch the application easily with just a click of the mouse.

That's a package full of savings. Norton Desktop for Windows 2.0 enhances Windows in all the important ways. It helps you work faster, smarter, and with better results.

Saves Time.

Something you don't have a lot of. We've improved file management, placing drive icons right on the desktop, so you get immediate access to all your files and applications. Speed search, button bar, viewer, customizable fonts, and collapsible tree structure are all designed to save you time. Full drag-and-drop allows you to drag applications and files out of the drive window to anywhere on the desktop so you have instant access to them.

Saves Money.

We all know time is money. And because Norton Desktop looks so much like Windows, you won't have to waste time learning how to use it. You get most everything you need to run your PC in one comprehensive package — a great, money-saving value.

> "Norton Desktop for Windows 2.0 is still one of the best productivity tools you can buy."
> — *PC Computing*, 5/92

Network Manning Admin Pack
NOW AVAILABLE
Call 1-800-343-4714
ext. 794 for more information.

Saves Energy.

Because Norton Desktop can be easily customized, you invest your energy in your work, not in trying to figure out how to get it done. Customizable auto-load frees you from reloading applications that you use daily. And, SuperFind™ allows you to locate "lost" files, across networks or in the background.

Saves Data.

Lost or corrupted data can cost you time, money, and energy. The selection of utilities in Norton Desktop helps you maintain your data. Virus protection and repair, automatic backup, and data recovery can be easily accessed from the desktop; or, scheduled to run unattended, or in the background. Plus, they support all major networks. Norton Desktop for Windows 2.0 is just $179.00 (S.R.P.) at your dealer. Or, call **1-800-554-4403** for an instant FAX Data Sheet (enter 450).** The sooner you get it the sooner you'll save.

SYMANTEC.™

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INTRO

A LITTLE SO

WINDOWS S

Launch your favorite applications, with a click of your mouse.

Click for immediate access to applications in the Windows Program Groups.

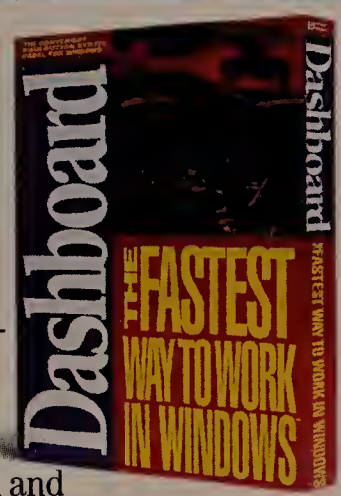
Instantly change the default printer, reconfigure existing ones, and drag and drop documents to print.

Actual Size

Monitor and control memory and system resources with the Resource Gauge.

Instantly switch between complete screen setups in up to 9 full-screen views in just one step.

DUCING
ETHING FOR
EED FREAKS



Mention the word "fast," and Windows users get a wild look in their eyes. Why? Because they have a need. A need for speed. Well, here's a little something that satisfies those cravings: Introducing Dashboard.™ The fastest way to work in Windows.™

Dashboard is the convenient push-button utility panel that makes quick work of complicated operations in Microsoft Windows.® Zip into your favorite applications with a click. Switch between different full-screen views of applications in one step. Instantly change the printer default, or drag and drop documents to print... never has so much speed and convenience been packed into so little screen and disk space. Everything, even a clock with alarms, and a "fuel" gauge to monitor your memory usage, is instantly accessible. Whenever you feel the urge.

So the next time you get that uncontrollable craving, you'll know what to do. Grab hold of the world's fastest push-button utility panel, Dashboard For Windows. And get all the speed you need.

See your dealer or call 1-800-554-1305 Ext. 801W.

FOR WINDOWS™

Dashboard

The Fastest Way To Work In Windows™

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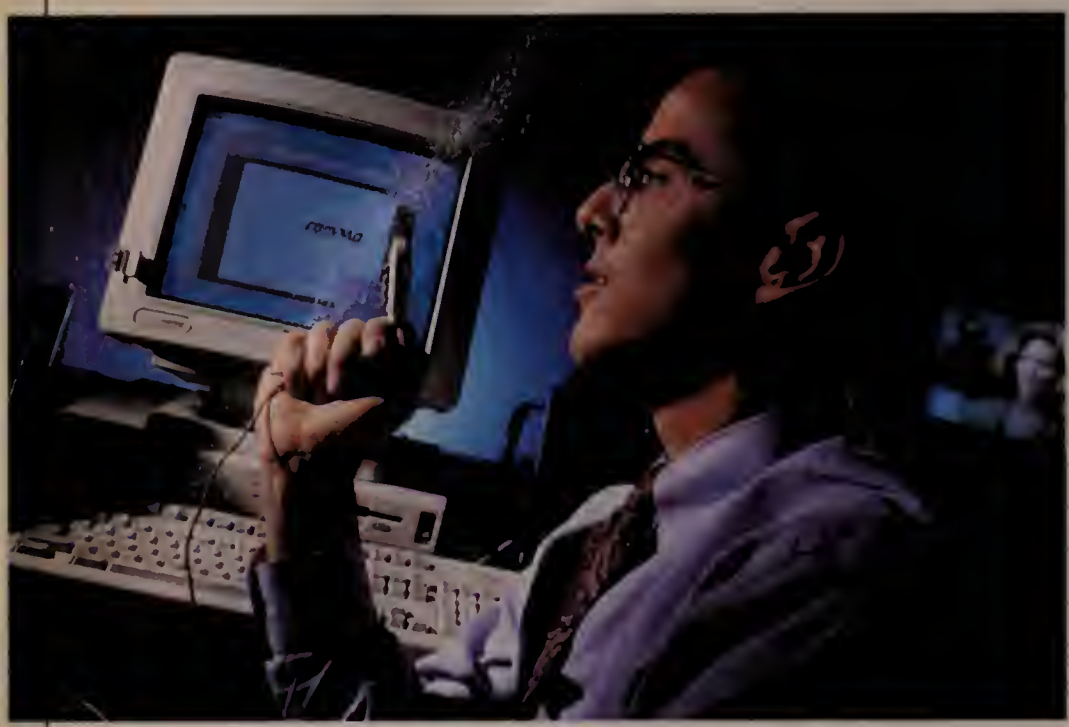
Circle 114 on reader service card

Windows Masters Its Voice



Compaq product manager Blake Irving: a PC audio pioneer.

TEST DRIVE Microsoft's Windows Sound System offers a unique combination of hardware and software functions, including voice recognition, that raise PC audio to a new level—at a startlingly low price.

This $289 package, which includes headphones and a microphone, enables you to voice-annotate documents, hear your spreadsheet being read aloud, send voice E-mail—even speak commands to an application.

The Sound System lets you record and play CD-quality sound and listen to MIDI music files, and it features an easy, automated installation routine. The sound quality matches all but the highest-priced audio adapters'; a Voice Pilot feature, which lets you tell the PC what to do, is not only useful, it brings back some of the fun of computer use.

Setup is simple. The software checks your PC and determines if you need to change jumper settings. If so, it shows you how to adjust them. If there are conflicts with other boards in your PC, you can reset DMA and hardware interrupts in Sound System's setup software.

The Sound System's ProofReader is the most immediately useful tool for *Windows* spreadsheet users: As ProofReader calls out your data you can listen and cross-check your source. The standard vocabulary includes days of the week, numbers up to a quadrillion, and units of measure. To add a word to the dictionary, type it and then speak it.

The easy-to-use Quick Recorder feature boasts an impressive range of recording quality, from low-quality 11 KHz at 8 bits to CD-quality 44.1 KHz at 16 bits. You can use it from a simple tape recorder button interface or switch to an expanded view with special effects and a graphical representation of the recorded sound.

With Windows Sound System you can embed a quick spoken commentary into a word processing document or an E-mail file. Through OLE, Quick Recorder can attach a voice "Post-it" to applications that don't have audio capabilities.

The Voice Pilot has a number of predefined commands for basic *Windows* operations, as well as 15 application-specific vocabularies. Voice Pilot should recognize most users' voices without training.

Microsoft's biggest customer for audio technology has been Compaq. Compaq pushed the use of PC sound in corporations with its Business Audio product, which includes a subset of the Sound System. The company expects to log orders for more than 150,000 Business Audio systems by year-end—four times its original sales forecast, according to Blake Irving, product manager.

"This is part of *Windows*, it's what *Windows* is supposed to be," Irving says.

—Paul Worthington

Windows Sound System

Add business sound features to any Windows PC

Key Features

- **16-bit soundboard**
- **Proofreads Excel and 1-2-3 for Windows**
- **Voice annotation for any OLE application**
- **Voice control for 15 Windows applications**

Availability
October 1992

Pricing
$289

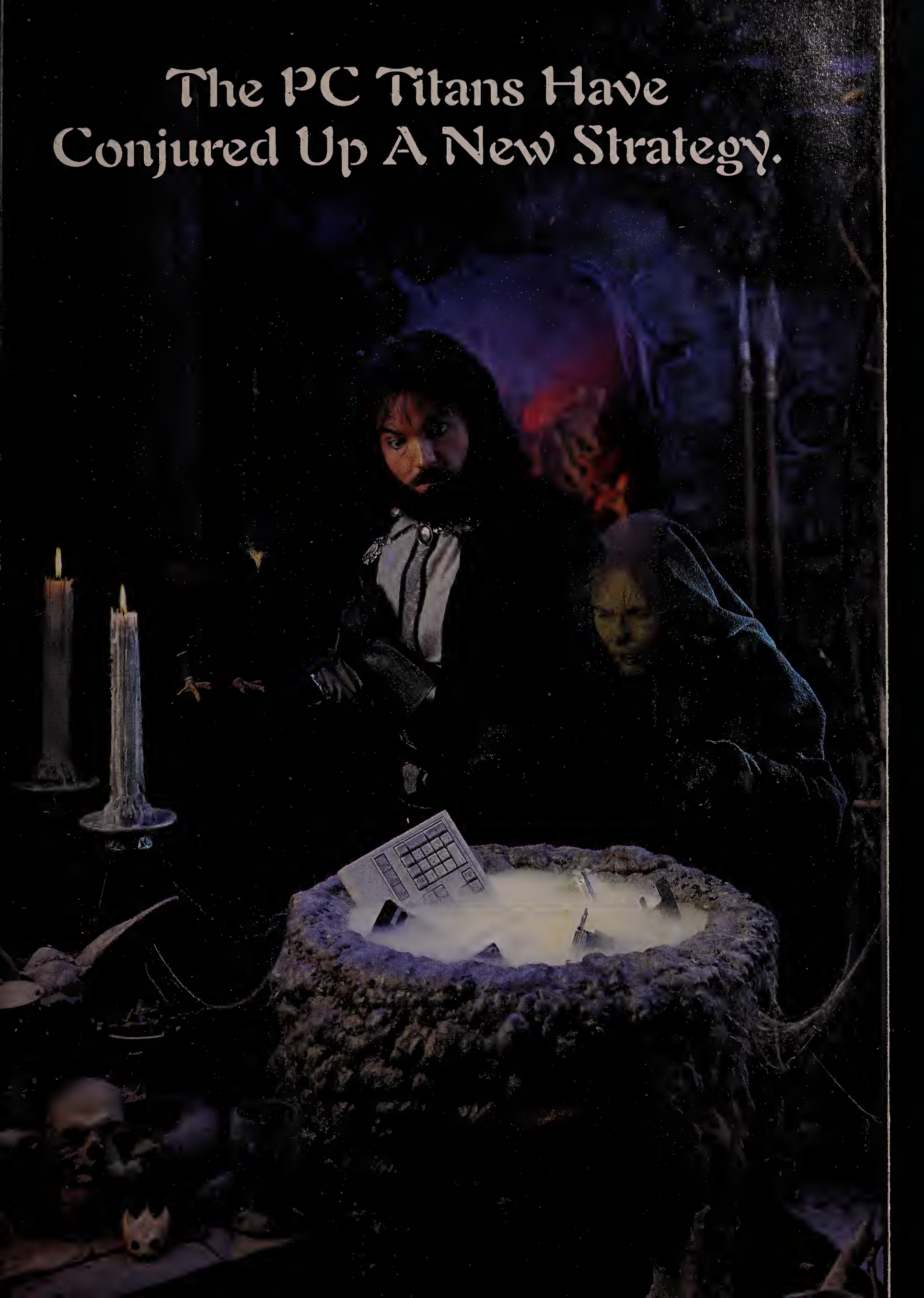
Microsoft Corporation
206/882-8088
Reader service no. 742

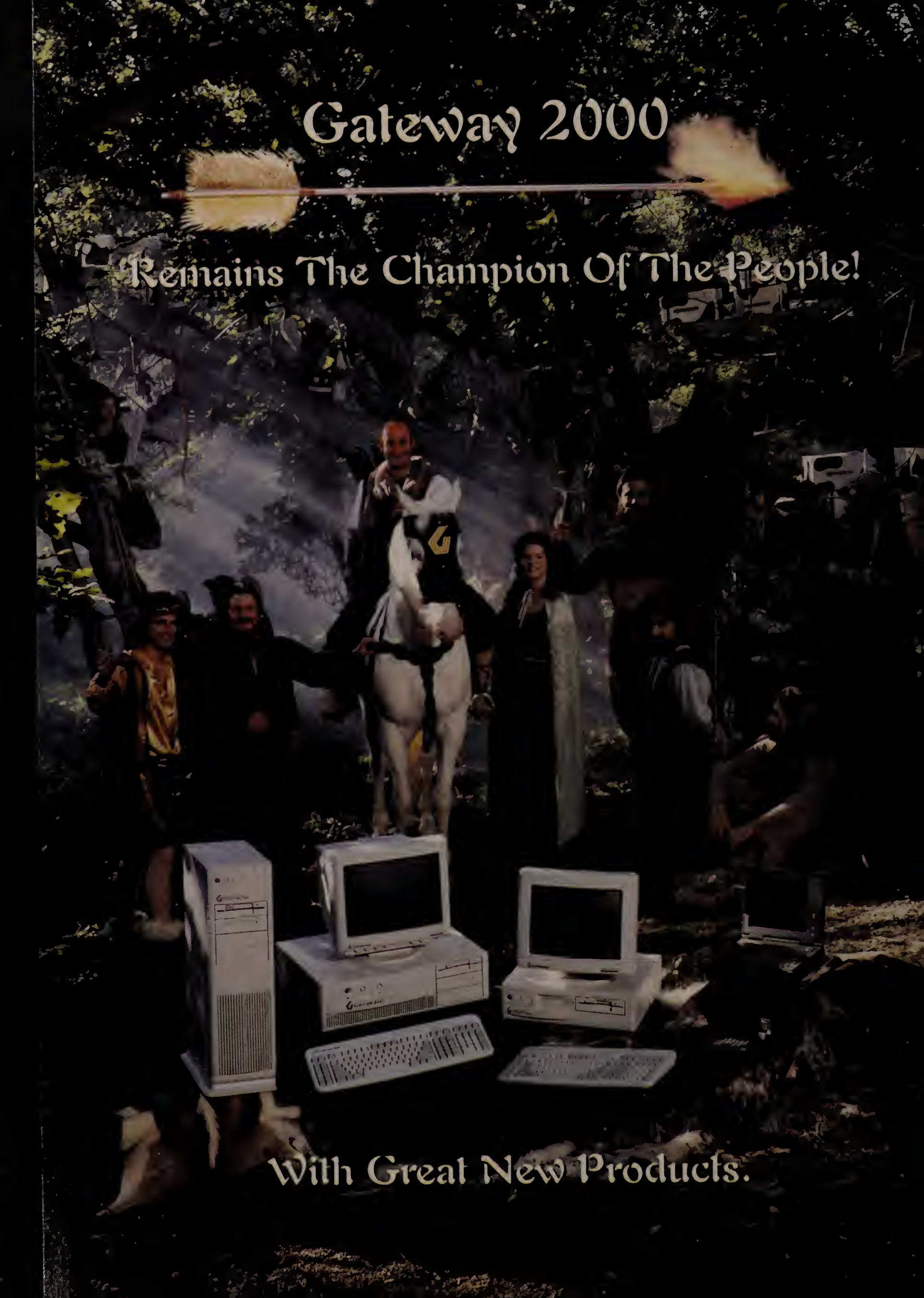
The PC as Personal Communicator

A new class of devices that meld computers and telephony will be unveiled later this year by Eo, Incorporated, of Mountain View, California. The secretive start-up went public in October with its strategy to develop a family of small, low-power, highly integrated systems designed to keep you in touch with your office, home, and friends, wherever you are.

Eo's product will be a communications device that does computing, says company president Alain Rossmann. This computer phone will send and receive voice, data, and fax. You'll be able to manage your messages and work on documents you receive. Sound far out? It could happen if Rossmann succeeds in his plan to tie Go Corporation's PenPoint operating system and the Group III fax standard to his hardware. The result: a standards-based wireless communications highway with built-in holding patterns for messages and links to 50 million fax machines worldwide.

Rossmann as the wireless communicator.


The PC Titans Have
Conjured Up A New Strategy.


Gateway 2000
Remains The Champion Of The People!
With Great New Products.

nce upon a time, a band of young rebels known as Gateway 2000 launched a crusade against the PC Titans' bloated prices and tyranny in the computer industry. Price Wars raged as the Titans attempted to vanquish the value-driven upstarts, but the lumbering giants could not match the speed or strength of the rebel attacks.

So the Titans plotted a crafty revenge: they'd cut quality and features, thereby to match the renegades' prices. They surmised this evil plan would fool the buyers and chase the merry men and women of Gateway right out of the forest!

With great fanfare, the Titans charged — only to fall into a clever trap! The woodsmen had crafted powerful new weapons — smarter, better, harder-working and more value-packed than ever. And the people turned against the Titans' trickery and flocked to the banner of value.

Once again, there proved to be one strong and true victor in the ongoing Price Wars. Gateway 2000 remains the Champion of the People, and the best value prevails.

GATEWAY2000

You've got a friend in the business.

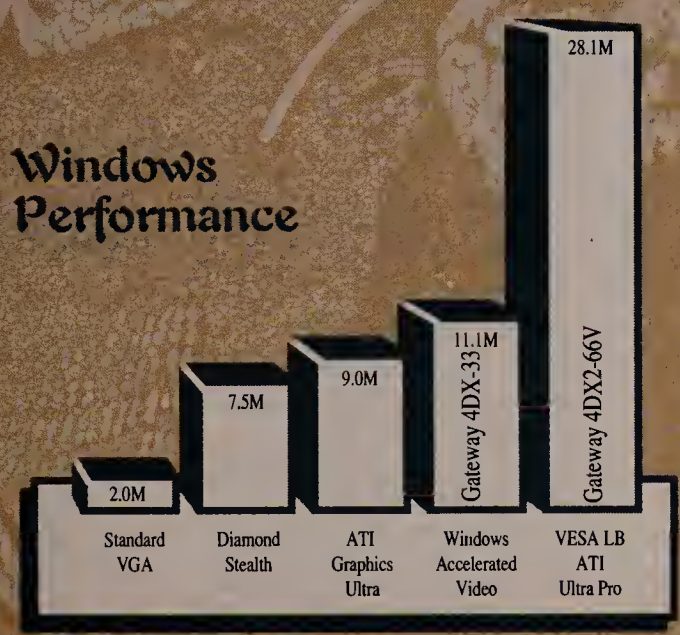
New Legends Are Born!

Introducing a new, redesigned Gateway 2000 line with faster video, bigger hard drives, local bus and the latest processors. True to form, we've boosted performance and lowered prices!

VESA Local Bus

Unlike most proprietary implementations on the market, Gateway's local bus meets VESA (Video Electronics Standards Association) standards for compatibility. Local bus gives you a 32-bit path with no other data traffic to slow you down – and operates at the speed of your processor rather than at the slow 8MHz ISA-bus speed.

To get optimal performance from the local bus, we added ATI's™ new Graphics Ultra Pro video system, which is nearly three times faster than the ATI Graphics Ultra. Our systems with the Ultra Pro score up to 28 million Winmarks – *PC Magazine's* video benchmark – even though this benchmark doesn't adequately show the effect of local bus on video performance.



Based on Winmarks. Video performance varies with processor.

IDE hard drive controllers are on the local bus, too, for screaming disk performance.

Faster Mini Desktop Systems

Our compact, mini desktop systems have improved, integrated motherboards, faster video, and 486 models have high-performance local-bus hard drives. These little machines hit the bullseye with the biggest bang-for-the-buck in the history of PCs!

Road Warriors

The **Nomad** makes the perfect traveling companion. Wherever you journey, our lightweight Nomad notebook computers give you desktop performance – in 386SX-25, 486SX-20 and 486DX-25 models.

Features include 4MB RAM, an 80 or 120MB hard drive, depending on the model, and a 10-inch backlit screen that's one of the biggest and brightest in the industry. With patented power-management features, you can get over six hours of operation from a single battery! The Nomad with battery weighs less than six pounds – and it's made in the U.S.A.!

The **HandBook**™ is a one-of-a-kind, real PC in miniature form! HandBook owners tell us you can carry it with you everywhere, to do all kinds of work – and it weighs so little, you have to check your briefcase to make sure it's there!

The HandBook weighs just 2.75 pounds and measures about 6 x 9 inches, yet delivers 286-class performance for all your DOS applications with a bright, backlit screen, 40MB hard drive and a comfortable 78-key keyboard that allows touch-typing. And you get up to 4.5 hours of battery life with power management.

Bountiful Software

Every Gateway system includes free, pre-installed software! (Check our system configurations on the back page of this ad for details about which software packages come with which systems.)

- NEW! Our Cool Tools for DOS is a utilities software package that comes with all Gateway desktop systems, including: QAPlus™ from DiagSoft™ (for diagnostic hardware testing), Central Point® Anti-Virus, RAM Boost, Defrag and Emergency Disk (for recovering your precious data if you have hard drive problems).
- If your system includes "choice of application software," you can pick one option from the following selection of popular applications, all latest versions: New – MS Word and Bookshelf® 92, CD-ROM edition; MS Excel for Windows;™ MS Word for Windows;™ MS PowerPoint for Windows;™ MS Project for Windows;™ Borland Paradox® and Turbo Pascal or C++;® The MS Entrepreneur Pack (Works,™ Publisher,™ Money™ and Games); The Windows Programmer Pack (MS QuickC,™ Visual Basic and more). You can also upgrade to Microsoft Office™ for $175.

Extras From Merry Gateway

- One-year limited warranty
- 30-day money-back guarantee
- Free on-site service to most locations (factory service only for notebooks)
- Lifetime toll-free technical support and BBS membership

Peripherals At Gallant Prices

NEW! Microsoft Windows Sound System™

Here's the sound system designed especially for business use. "Speak" commands to your PC, embed audio messages in all your Windows OLE applications and much more! Full Adlib compatibility. Package includes soundboard, microphone, headset and software.

$149 *(with the purchase of a system)*

NEW! CD-ROM Kit

Package includes interface card and everything you need to add CD-ROM to your PC. Manufactured for Gateway by Sony.® MPC-compliant.

$225

CrystalScan 15-Inch Monitor

Non-interlaced 15-inch color monitor with flat, square screen – an upgrade option with the purchase of any Gateway 2000 desktop system.

$125 *(upgrade price)*

The TelePath™ Fax/Modem

A 14,400 bps modem, V .32bis, with 9,600 bps fax capability. Includes WinFax Pro,™ Crosstalk™ for Windows, Qmodem™ and more.

$195

Also available – printers, tape backups and other peripherals. Call for details. (Sorry – we sell components, peripherals and software only with the purchase of a system, or to previous customers.)

Gateway 2000 Champion Values

PORTABLE SYSTEMS

HANDBOOK™

- 286-Class Performance
- 1MB RAM upgradeable to 3MB
- 40MB Hard Drive
- Backlit 7.6" CGA Screen
- Size 5.9" x 9.75" x 1.4", 2.75 Lbs.
- 4.5-Hr. NiMH Battery & AC Pack
- 1 Parallel/1 Serial Port
- 78-Key Keyboard
- MS-DOS® 5.0, LapLink® XL, MS Works,™ Central Point® Desktop & Serial Download Cable
- Carrying Case

$1295

NOMAD 325SXL

- 25MHz 386SXL Processor
- 4MB RAM
- 3.5" Diskette Drive
- 80MB IDE Hard Drive
- Backlit 10" VGA Screen, 64 Grays
- Simultaneous Video with 256K
- Size 8.5" x 11" x 1.8", 5.8 Lbs.
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With AST's Power Exec, the Power Is On. . . Longer

AST's next-generation Power Exec notebook not only is smaller, lighter, faster, and cheaper than its well-received Premium Exec, it also may be the most versatile, long-running competitor in the mainstream notebook class.

Measuring 8.5 by 11.5 by 1.83 inches and weighing 5.9 pounds, the Power Exec is a little narrower, about half an inch slimmer, and a pound lighter than the Premium Exec, which it replaces as the company's flagship notebook. It's comparable in size to the Compaq LTE Lite/25 but, at $2395 for a 60MB monochrome version, about $400 cheaper than the Lite/25. (The Premium Exec line has had its prices slashed in order to make room for the Power Exec.)

Four-Hour Life

If AST's claim of 4 hours plus of continuous computing on a single battery charge in full-power mode is true, the Power Exec will outlast the Lite/25 by an hour or more (a claim that still must be subjected to rigorous testing). AST notebooks have always excelled at power management, and the company pulled out all the stops to extend the Power Exec's battery life.

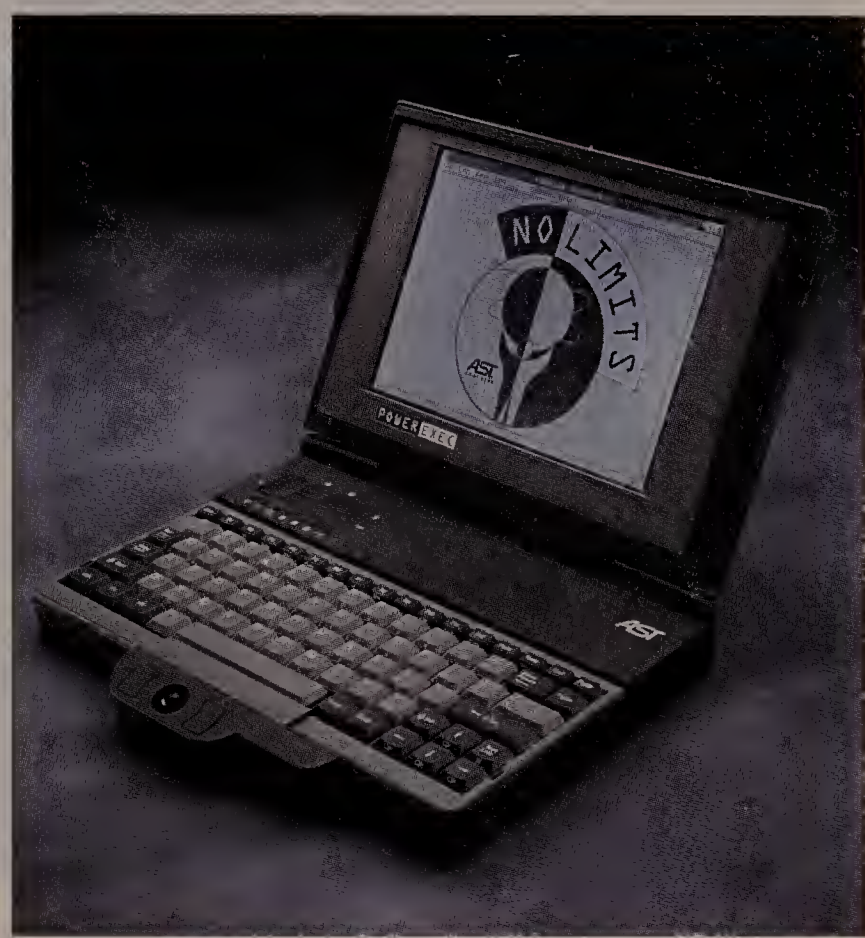
AST software engineers designed an extremely smart power management system that "learns" how quickly it should shut down the backlight, hard disk, and other components under the different application sets you use. An on-the-fly pop-up lets you set the Power Exee for full power, half power, and other conservation modes as with other notes, but the software takes it from there and finds ways to save just a little more juice by, say, turning the hard drive off more frequently during word processing than with spreadsheets.

The power conservation system is so complete, the Power Exec will even run an hour or more on a dozen AA alkalines, saving you the 1.53-pound traveling weight of an extra nickel-metal-hydride battery pack. A small battery facilitates the hot swap of battery packs. Battery pack circuitry measures the amount of power drain, information that the system's battery management controller uses for reducing the normal 3-hour trickle charge to as little as 2 hours. The maximum recharge with the system off is only 90 minutes. Naturally, plugging into AC charges the battery and disables power management for greater user convenience.

The 25-MHz Intel 386SL with 64K cache, BIOS, and memory ride a daughtercard that you'll be able to swap easily for another with one of the faster, power-stingier 3.3-volt processors toward year-end, when compatible core logic and memory should be available in sufficient quantities. The standard 4MB of RAM expands to 20MB with AST proprietary memory modules.

Removable Drive

Flexibility is another Power Exec catchword. The hard drive can be removed and transferred to any desktop equipped with an AST IDE drive bay adapter (a feat also accomplished by Epson). Likewise, the 9.5-inch VGA mono screen can be swapped for an improved passive-matrix color display and, soon, an active-matrix color display. The mono version displays 64 shades of gray at 640 by 480.



AST's Power Exec aims for the battery-life crown by claiming more than 4 hours of operation in full-power mode.

A pair of back-to-back Type 2 PCMCIA slots take fax-modem, ethernet, SCSI, and flash ROM cards. The system also supports the optional PowerStation docking station, which has two drive bays, two 16-bit slots, two serial ports, a parallel port, and monitor, mouse, keyboard, and charger ports. The Power Exec sports a full-size, 3mm-travel, 83-key keyboard and a built-in hot shoe for a new optional AST trackball pointing device (or just use <Fn>–*cursor-key* combinations for slower pointer travel).

The 80MB-equipped Power Exec Model 83 starts at $3495 for the passive-matrix color unit. You can add 12ms hard drives at $500 for 80MB, $700 for 120MB, and $800 for 160MB.

While you may find better individual features on some notebook competitors, the Power Exec succeeds as a balanced alternative for mainstream mobile users.

—Mike Hogan

AST Power Exec

AST's new notebook offers a clever balance of sophisticated power management and snap-in options.

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Wyse Decision Banks on AMD's 40-MHz Am386DX

The Wyse Decision 386/40, a prime example of a non-Intel PC.

If you're in the market for a high-performance midprice PC, you'll probably narrow your choices down to two types of systems: those using AMD's 40-MHz Am386DX and those based on Intel's 25-MHz 486SX chip (see "PC Price War: 486SX vs. 386/40," March 1992). The 40-MHz 386 systems provide a speed advantage over their 486SX brethren, although the latter group of chips can be augmented with Intel's upcoming clock doubler chip.

The new Wyse Decision 386/40 is a good example of the current crop of non-Intel-based systems. Built around the AMD chip, it's a speedy contender and an excellent *Windows* machine. Although priced toward the midrange of the competitive spectrum, it's a solidly built system with plenty of expansion options.

The motherboard features a user-selectable multispeed ISA bus, which operates at 13.33, 10, or 8 MHz. Wyse claims the fastest bus option results in 20 to 30 percent performance improvements in screen updating and disk drive performance over standard 8-MHz machines. Additional speed gains come from a 128K RAM cache (upgradable to 256K).

Switching to the 13.33-MHz bus does make a noticeable improvement in overall performance. *Windows* is fast and snappy, and if it weren't for the numbers printed on the front of the unit, you might think you were operating a 486 machine.

There's room to grow, with seven expansion slots available (six 8/16-bit and one 8-bit) and three drive bays. The system includes 4MB of RAM, expandable to 64MB. The hefty 200-watt power supply can drive anything you install with no problems.

The Decision 386/40 is available in three configurations: floppy drive only ($1599), with a 120MB hard drive ($1999), and with a 200MB drive ($2149). All options include 4MB of RAM, two serial ports, one parallel port, and MS-DOS 5.0. You'll need to buy a video card and monitor separately.

—John Walkenbach

Wyse Decision 386/40

This speedy system comes with 4MB of RAM and a user-selectable 13.3-MHz bus speed, resulting in enhanced performance.

Wyse Technology
800/438-9973,
408/473-1200
List price: $1599
Reader service no. 634

NoteBook's 486 Packs Power in a Tiny Box

Notebook computers just can't be too quick or too thin. Users who like to move in the fast lane may find a new traveling companion in NoteBook Computer's Model 486NoteBook T50. The 5-pound unit combines the body of a TI TravelMate 2000 with the brains of a 50-MHz 486DX2, creating one of the swiftest, lightest machines around.

Inside the shell of Texas Instruments' popular 8.5-by-11-inch laptop is NoteBook's custom electronics, which helps combat the inevitable power drain and prevent the 486 processor from overheating. The $4699 model comes with 4MB of RAM (expandable to 10MB) and an 80MB hard disk. Slap another $200 onto the list price for a 120MB hard disk and $219 for an external 3½-inch floppy drive.

The T50's proprietary power management features squeeze an hour of juice from its internal battery. Fortunately, there's a 1.8-pound external battery and recharger that adds between 3 and 5 hours to the T50's operating time, according to the company, and $179 to its price. The company claims you can swap external batteries without powering down and suspend all operations, including *Windows*, to conserve battery life.

The T50's 10-inch black-on-white LCD features 640 by 480 resolution with 16 levels of gray. An interface for a second monitor runs an extra $109; an internal fax-modem costs $299.

The T50 comes with DOS 5.0, *Lap-Link Pro*, and a battery utility but no mouse or trackball. A 30-day money-back guarantee and a one-year warranty are standard, and NoteBook promises 24-hour turnaround on repairs.

—Daniel Tynan

NoteBook Computer Model 486NoteBook T50

The Concorde of notebooks, the T50 puts a 50-MHz 486-DX2 inside a 5-pound box.

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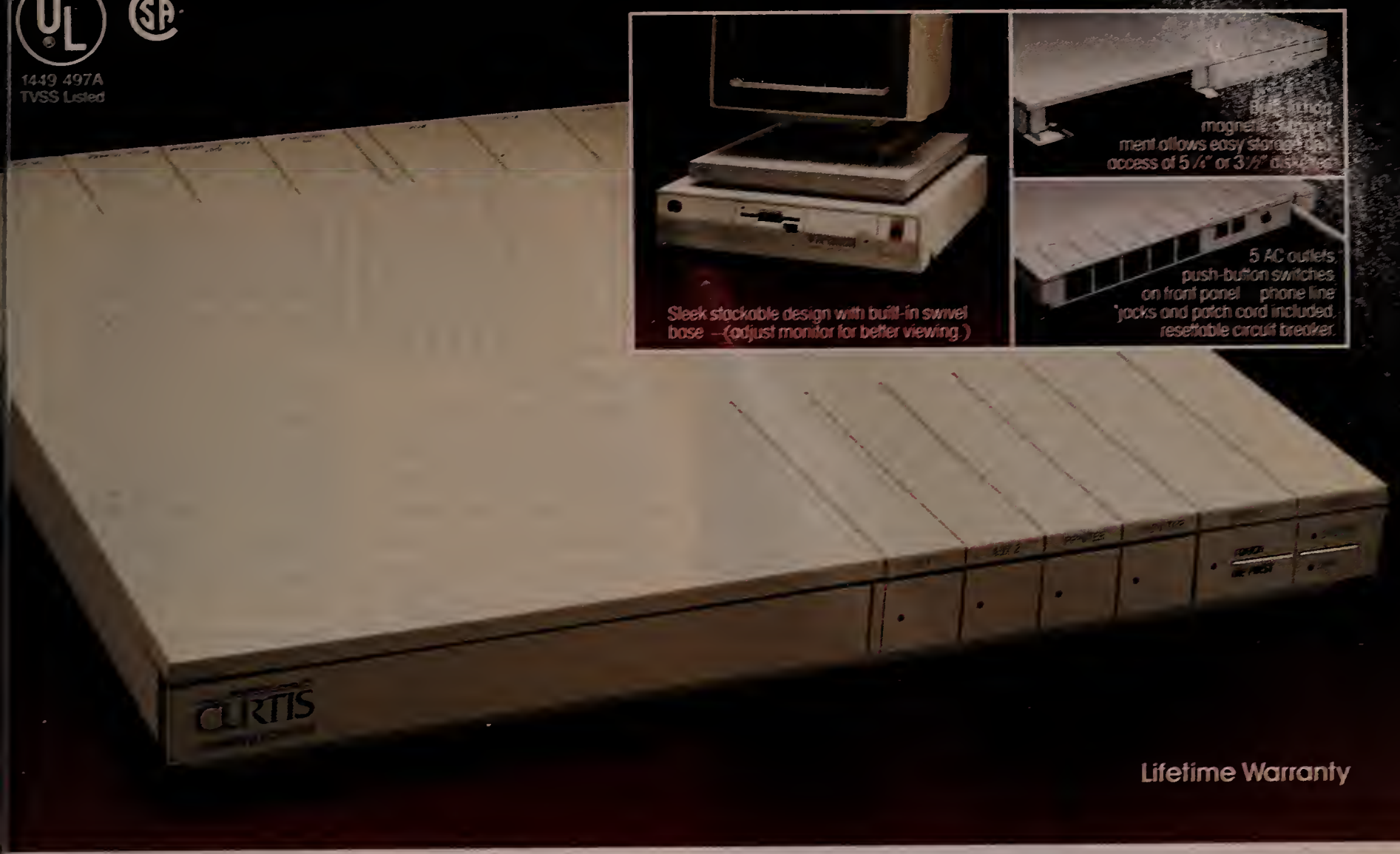

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Zeos's Pocket PC and Freestyle/SL: Big Little Ideas

Zeos's $595 Pocket PC is a 1.3-pound notebook computer that's as light as they come.

Two firsts from Zeos: a pocket PC you can really type on, and a notebook with a tilt-and-swivel screen for better viewing.

The $595 Pocket PC belongs somewhere between the palmtop category pioneered by the HP 95 LX and the emerging subnotebook class. The first mini PC with a keyboard large enough for serious typing, it measures just 9½ by 4½ by ⅞ inches and weighs 1.3 pounds, small and light enough to carry around all day in a jacket side pocket. Zeos claims the unit can run continuously for 10 hours on two AA batteries. Throw in the 5-ounce pocket fax-modem ($249) and a few extra batteries, and your traveling weight still hasn't broken 2 pounds.

Naturally, such portability means giving up a few things. The CPU is a poky 7.15-MHz 8088-compatible NEC V30. The 7-by-2.75-inch screen is low-resolution double-scanned CGA (640 by 200), unlit, and unreadable in some situations. The standard 1MB of RAM can't be expanded. The system has no hard disk; instead, the C: drive is a 1.5MB ROM into which Zeos squeezes DOS 5.0, *Microsoft Works 2.0*, a calendar-scheduler, a serial-port file transfer utility (cable included), and a few other programs.

The D: drive is a 250K RAM disk, which, like the main memory, is battery backed. Since the Pocket PC has automatic suspend mode, you can shut down in the middle of a task and pick up later right where you left off. There's no floppy drive, though there are two slots for PCMCIA static RAM (SRAM) cards, which appear as A: and B: and cost $149 for 512K, $249 for 1MB, and $449 for 2MB.

The big question about the Pocket PC is, Can you type on the keyboard? This will be a matter of taste. The keys are a bit narrower than on a standard AT keyboard and have 2mm (rather than the usual 3mm) of give, so it's slightly cramped. But if you don't like the feel, Zeos offers a 30-day unconditional money-back guarantee.

The design of Zeos's 5.6-pound Freestyle/SL sets it apart from the notebook crowd. The most noticeable innovation is an adjustable tilt-and-swivel bracket that lets you angle the screen for comfortable viewing. Another innovation is the "mouse key," a sort of key-size joystick just to the right of the <Space> bar. There's also a PS/2 mouse port that can be used for a keyboard or numeric pad.

The Freestyle/SL uses a 25-MHz Intel 386SL CPU with a 64K external cache. The basic $1895 model comes with 2MB of RAM, which is upgradable to 20MB, and a 60MB hard disk. A $2495 package gets you 6MB of RAM, a 120MB hard disk, a carrying case, DOS, and *Windows;* for $2995 you get 10MB of RAM, a 180MB disk, a second battery, an external battery charger, and a 2400/9600-bps internal fax-modem.

—Robert Lauriston

Zeos Pocket PC, Freestyle/SL

The 1.3-pound Pocket PC is unique. The Freestyle's design details set it apart from the notebook crowd.

Zeos Int'l, Ltd.
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612/633-4591,
612/633-1325 (fax)
List price: Pocket PC $595, Freestyle/SL $1895
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If you yearn for the simplicity of touch-screen input but don't want to spring for a new monitor, the TouchMate may be the answer. Just slide this bathroom scale–size unit under your monitor and plug it in. Then install the included *Windows* driver, and you can press on-screen buttons with your fingertips or have the cursor follow your finger across the screen.

When you consider that touch monitors cost $1100 and up, the TouchMate's $895 price is surprisingly competitive. The unit can be used with any monitor up to 90 pounds and 19 inches and installs in minutes.

—Anita Hamilton

TouchMate

TouchMate brings cost-effective touch input capabilities to almost any monitor.

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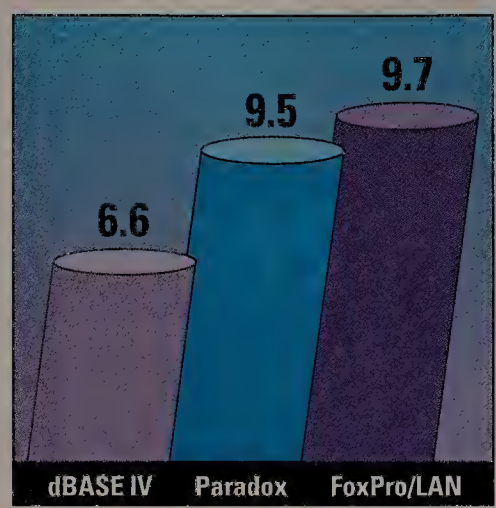

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Faxes are ugly. Even printed on plain paper, they're jaggy and hard to read. A new solution from NEC combines PostScript printing with fax board technology—and promises to redefine not only how faxes look but also how we look at faxes.

Unlike a typical fax board, the Model 9510 PostScript Fax Option installs in an NEC Silentwriter Model 95 printer, not a PC. The $599 add-on comes with software that makes sending a fax from your PC as easy as printing a document. Select *Send Fax* instead of *Print*, and the software directs your document to the 9600-bps fax board.

You can make cover sheets, broadcast faxes to multiple locations, schedule transmissions, and store frequently used phone numbers. But there's no way to view incoming faxes on screen or save them to disk—they're sent directly to the printer.

While the Model 9510 can send or receive faxes from standard Group III fax machines and print them at 200 dpi, the real benefits come when you have a PostScript fax at both ends. The Model 9510's compressed PostScript code cuts transmission time. More important, the recipients get an exact duplicate of the original, which they can output at 300 dpi or higher, depending on the resolution of the receiving device. The Model 9510 promises to work with Adobe PostScript fax products from other vendors as well as NEC.

The $1749 Silentwriter Model 95 features PostScript Level II with 35 scalable fonts and 2MB of RAM, expandable to 5MB. The Model 9510 Fax Option offers free factory or on-site installation and comes with DOS and *Windows 3.0* or *3.1*.

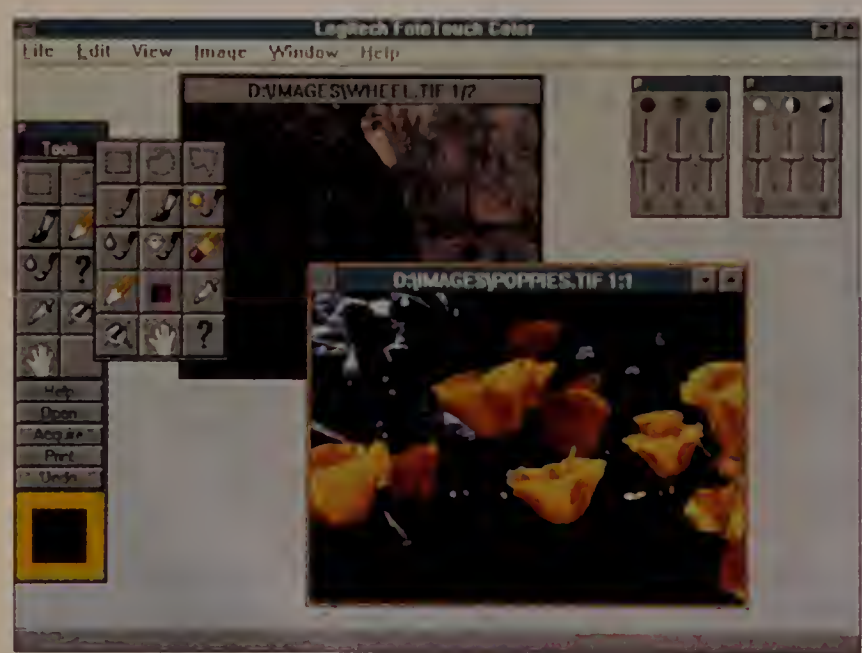
—Daniel Tynan

NEC Model 9510 PostScript Fax Option

Plug this PostScript fax board into NEC's Silentwriter Model 95 printer, and say good-bye to ugly faxes.

NEC Technologies, Inc.
800/388-8888
List price: $599
Reader service no. 619

ScanMan Gets Color and Improved OCR



ScanMan Color includes FotoTouch Color Image Editing software, which provides a full range of editing tools.

Logitech's ScanMan Color is the first hand scanner to put 24-bit color within your grasp—at a price that won't make you lose your grip. *CatchWord Pro*, a *Windows* OCR package that Logitech sells separately, offers optical character recognition features previously unavailable to color hand scanner owners.

ScanMan Color costs a reasonable $699 and scans up to 16.8 million colors—the entire color spectrum distinguishable by the human eye. It includes Logitech's versatile *FotoTouch Color Image Editing* software with AutoStitch capability, which automatically merges the multiple scans necessary when your printed source is wider than 4 inches.

There's a full complement of editing tools, including easy-to-use slider controls for adjusting brightness, contrast, tone, color balance, and special transparency effects. ScanMan Color requires at least a 386SX processor, *Windows 3.x*, 4MB of RAM, 5MB of free disk space, and one free 16-bit slot.

If you need optical character recognition, check out *CatchWord Pro*. Like *FotoTouch*, it automatically stitches together up to four passes and de-skews text for more accurate recognition. *Windows* users will appreciate the Multiple Document Interface, which lets you scan documents in up to six windows, pick and choose only the relevant parts of each document, and then "recognize" them as a scanned image all at once.

CatchWord Pro comes with macros for *Word for Windows* and *Ami Pro* so you can scan documents straight into your word processor. Unique text tools include search and replace, the capability to remove extra spaces between words before saving the scanned image, and a spreadsheet tool that flags letters where numbers should be.

Catchword Pro costs $299. ScanMan owners can buy it for $79 through Logitech.

—Bruce Kinnaird

ScanMan Color

The world's first 24-bit color hand scanner captures more than 16 million colors.

CatchWord Pro

WINDOWS **Logitech's OCR program brings sophisticated flatbed-type OCR features to hand scanners.**

Logitech Inc.
800/231-7717,
510/795-8500,
510/792-8901 (fax)
List price: ScanMan Color $699, CatchWord Pro $299
Reader service no. 623

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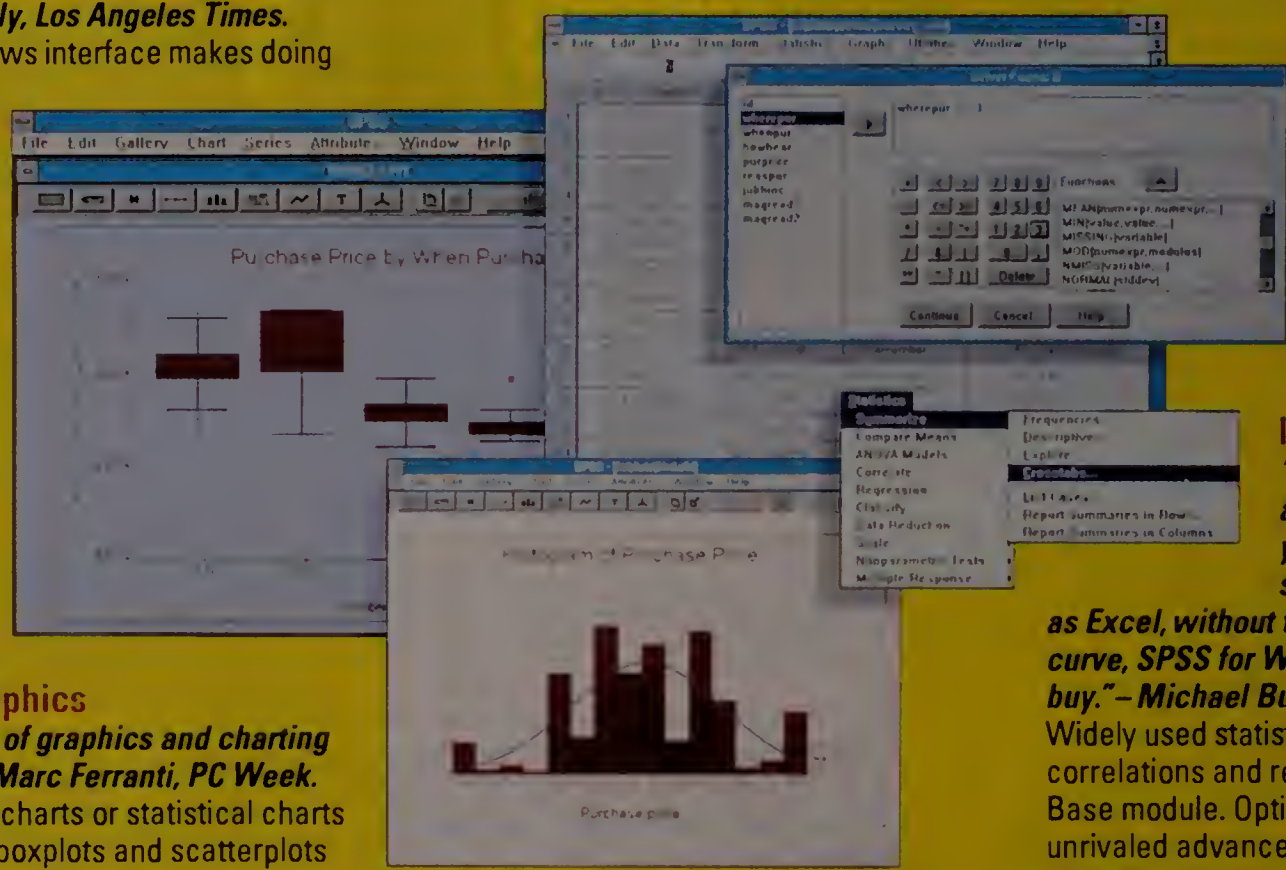

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"For more statistical analysis tools than you'll get from a spreadsheet such as Excel, without the steep learning curve, SPSS for Windows is a great buy." – Michael Burgard, PC/Computing.
Widely used statistics such as crosstabs, correlations and regression are in the Base module. Optional modules with unrivaled advanced statistics are available. You won't grow out of this package.

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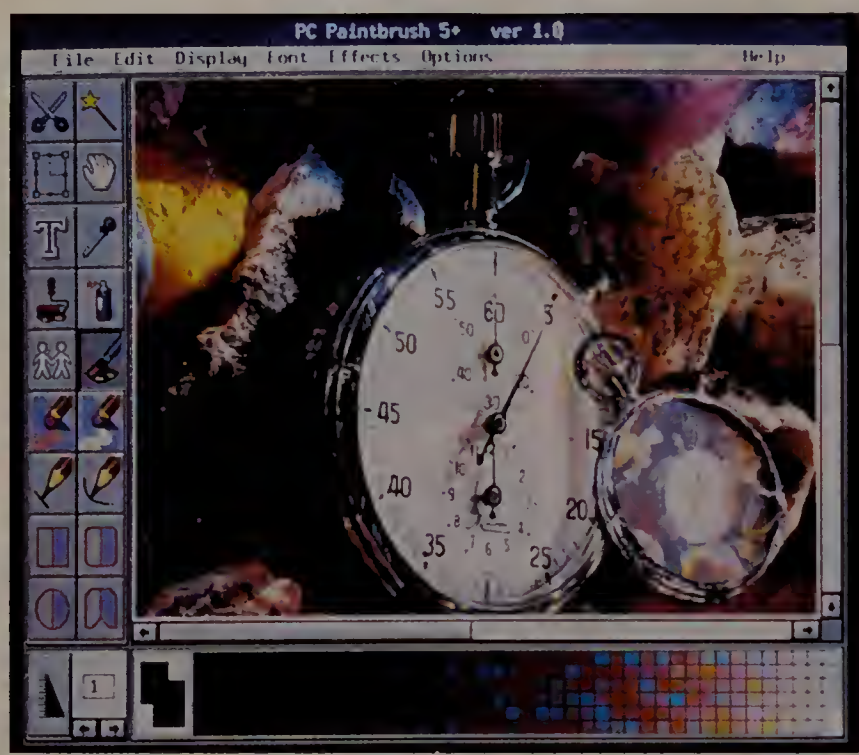
PC Paintbrush 5+: Easy Does It



PC Paintbrush 5+ features more than 40 tools to help you edit color and gray-scale images. This DOS upgrade sports a Windows-like interface—but still runs on PCs with a mere 640K of RAM.

In the last couple of years, a seemingly endless succession of painting and image-editing programs has hit the market, each program more capable than the last. But despite fierce competition from programs three to four times as powerful, *PC Paintbrush* outsells them all, claiming over 5 million users. Never the feature warrior, *PC Paintbrush* remains a favorite because of its unparalleled ease of learning and straightforward tools and commands. The new upgrade, *PC Paintbrush 5+*, delivers a handful of new tools, special effects, and filters in a package so tidy, you'll hardly notice it has changed.

Novice Ready

As always, the prime concern of *PC Paintbrush+* is to allow beginners and non-artists to edit handmade graphics, imported clip art, and scanned images without having to slog through a manual. With the help of redrawn tool icons and a revised collection of commands, novice and experienced users alike will be able to dive right in and doodle. If you somehow get lost, the caption bar provides cursor coordinates and content-sensitive help for quick reference. If your graphics wanderlust is curbed by the modest capabilities of a low-end machine, you'll appreciate the DOS-based *Paintbrush 5+*'s adherence to a *Windows*-like interface, complete with <Alt>-*key* command equivalents and straightforward navigational controls.

Though you wouldn't guess it at first glance, *PC Paintbrush 5+* packs 41 tools to address the needs of both color and gray-scale painters. To make it easier to modify color images, the new Magic Wand tool permits you to select a range of similarly colored pixels. Combined with color balance controls, the Wand tool lets you fine-tune highlights and shadows in a painting without having to hunt down and revise minute details tediously by hand.

To further enhance your ability to manipulate images, *Paintbrush 5+* improves on the duplication and transformation capabilities of its predecessors. The new Clone tool duplicates by enabling you to draw with a portion of your painting, a significantly less cumbersome solution than the traditional copy and paste commands. So you can generate 3-D effects on the fly, *Paintbrush* now provides a Perspective effects mode in which you can select a rectangular or irregular area and apply perspective that will make it pop out.

If you're sick of jagged edges, *Paintbrush* provides three new antialiasing tools for drawing soft lines. Because *Paintbrush*'s 256-color palette is too small to accommodate full-color antialiasing, the program provides these tools for gray-scale images only, enabling you to take advantage of hundreds of distinct shades of gray. The new antialiasing tools should prove to be a boon to those who are interested in embellishing gray-scale artwork and photos for newsletters and other publications printed on a black-and-white printer.

Filter Effects

If your system comes armed with a gray-scale or color scanner, *Paintbrush 5+* provides a variety of new image-editing filters that you can use. The Color Balance filter allows you to adjust away color aberrations, the Brightness and Contrast filters bring out nuances in an image that appears overly dark or washed out, the Emboss filter creates a raised relief effect that imparts a textured look, and the Motion Blur filter adds a sense of movement to static photographs.

PC Paintbrush 5+
The best-selling graphics application adds image-editing tools and color selection capabilities.

ZSoft Corp.
800/444-4780,
404/428-0008,
404/427-1150 (fax)
List price: $149
Reader service no. 624

Scanner Support

While you still won't mistake it for a dedicated photo-editing package, *Paintbrush 5+* embellishes these filters with built-in support for more than 50 of the most popular scanning devices. If that's not enough, the program will automatically optimize 24-bit images for display on standard VGA monitors. You can even merge multiple scans to create large, high-resolution images or complex photographic collages.

In addition to the standard PCX and TIFF file formats supported by previous versions, *PC Paintbrush 5+* also supports CompuServe's Graphics Interchange Format, which allows you to tap into a wealth of clip-art images posted on bulletin boards around the country. Despite its new range of capabilities, *Paintbrush 5+* continues to work on 640K PCs. Note, however, that the program no longer runs from floppy disk; a hard drive is essential. *PC Paintbrush 5+* lists for $149; upgrades are $69.

—Deke McClelland

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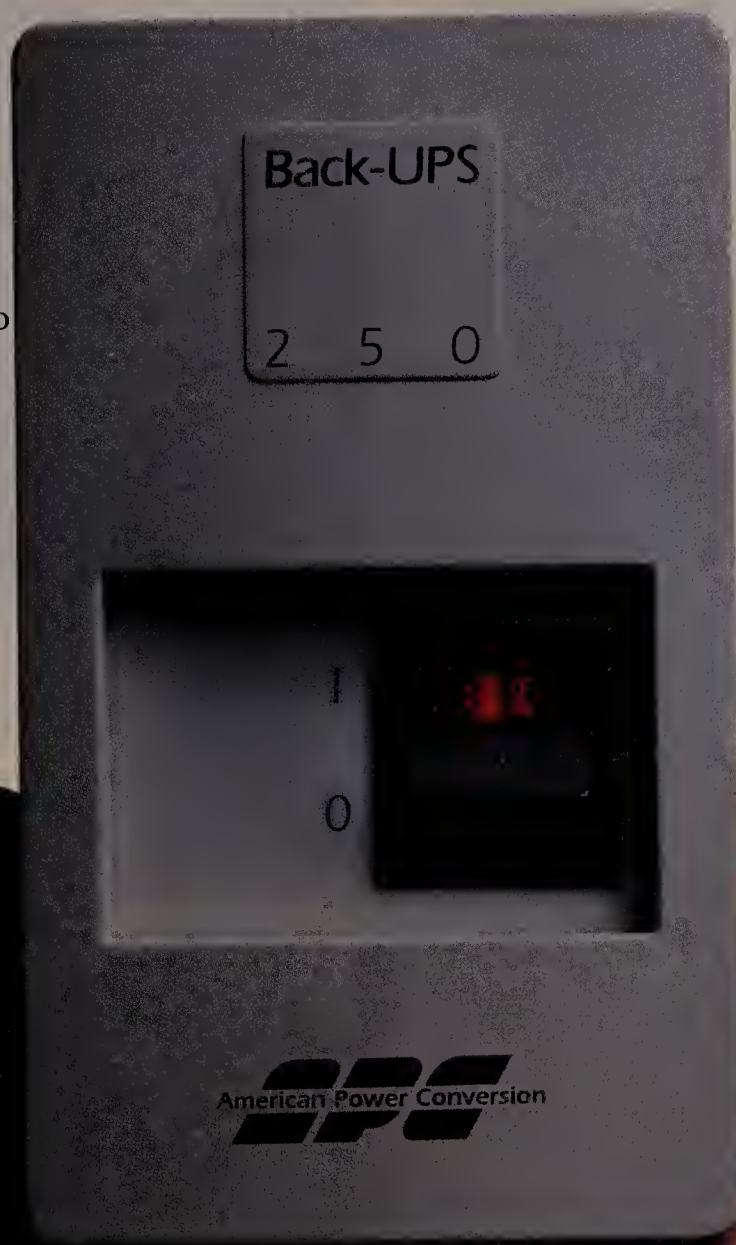

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1991, 1990

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Hype.

Saying bon voyage to your old spreadsheet is easier than you think.

Sometime soon, you'll probably be making a decision about a new spreadsheet. And that will probably mean a "spreadsheet for Windows."

When that day comes, we hope you''ll explore a little before choosing all in the same old boat you're in now.

You won't have to look very far to discover new Microsoft Excel 4.0 for Windows. It's the spreadsheet that makes your every by spreadsheet tasks, not a mention more complex things - amazingly easy. Just how easy?

Try one-stop pick about every thing. Hit enter, Autosum, an equally totals from or subtotals with a click-click of your mouse.

Autoformat lets you apply one of 14 professionally designed, sharp-looking formats to your worksheet with another click of your mouse.

They're both part of our customer-pleasing Toolbar, which also has a number of other handy features, such as a Spelling Checker and instant charting.

Then there are learning tools like Wizards, which are step-by-step guides of various features. Everything's designed to help you get your day-to-day number-crunching done with the greatest of ease.

But how easy is it to switch?

First of all, naturally you can bring all of your existing 1-2-3 work with you, because Microsoft Excel reads and writes all your 1-2-3 files, and runs your 1-2-3 macros - unmodified. So your investment with Lotus is safe.

What's more, Microsoft Excel lets you learn using what you already know. With Help for Lotus 1-2-3 users, when you enter your familiar 1-2-3 commands, Microsoft Excel 4.0 for Windows shows you the corresponding command. (By the way, we're the only spreadsheet for Windows that offers this easy way to learn. Surprised?)

Finally, if you're using Lotus 1-2-3 or Borland Quattro Pro, you can upgrade to new Microsoft Excel 4.0 for Windows for $129! (There's even a 90-day money-back guarantee!)

But there's much more to Microsoft Excel 4.0 for Windows than we can tell you about here. We recommend taking for a demo at your local software reseller's. Or just give us a call at (800) 323-3577, Department Y28, to find out more or to order your copy.

Before you know it, you could find yourself giving your old spreadsheet the old heave-ho.

Microsoft
Making it easier.

Facts.

This Microsoft ad on the left has a lot to say about their preadsheet, Microsoft® Excel. It also has a lot to say about *ur* spreadsheet, 1-2-3. But before you believe their ad, ask ourself "What are the facts and what's just hype?"

According to their ad, Microsoft Excel will read and write l your Lotus® 1-2-3® spreadsheet files and run your 1-2-3 acros unmodified. Well, that'd be very impressive—if it were l true. But the fact is, Excel *can't* read Allways files; or pre-erve formulas containing a 3D range; nor can it convert some K3 files to Workbooks; and it certainly can't run 1-2-3 macros ontaining commands from versions after Release 2.01.

Now, the ad on the left also tells you that a 1-2-3 user eed only type in a 1-2-3 command and Excel will show the quivalent command. Wrong, again. Excel only supports 2-3 Release 2.01 commands. In fact, Excel can't execute our familiar commands from Releases 2.2, 2.3, 2.4 and 3.1. ry pressing */, Range, Search* in Excel and see what happens. bsolutely nothing.

The fact is, if you're a DOS spreadsheet user, only 1-2-3 for Windows makes sense.

If you're a 1-2-3 user, you've created and saved hundreds f 1-2-3 files, styles and macros. It would certainly simplify our life if you could continue to use them, wouldn't it? Well, any 1-2-3 for DOS file, style or macro can be read and executed by 1-2-3 for Windows. And only 1-2-3 for Windows™—with its built-in Classic® Menu—lets you use your familiar 1-2-3 commands. Plus, only 1-2-3's 3D echnology gives you easy access to 256 Worksheets and lets you build true 3D formulas. In comparison, Excel's Workbook offering is a limited imitation of true 3D. Try opening a large 1-2-3 3D file in Excel and see what happens. If you're lucky, it will work. So for the 1-2-3 for DOS user moving to Windows, why would you use anything but 1-2-3?

The fact is, the new 1-2-3 for Windows is better than ever.

The latest release of 1-2-3 for Windows now includes performance enhancements. (For example, it's now the fastest Windows spreadsheet for printing on PostScript® printers. It's also the fastest to launch.) We've also added over 25 innovative new features, usability enhancements and new programming tools. New features include: customizable SmartFill which lets you create custom lists such as sales offices, department names, employee lists, etc. and use them again and again (a feature not found in Excel); SmartFormat, which gives you pre-defined table formats; 3D SmartSum for summing up columns or rows across and through your 3D worksheets; and the ability to create custom GUI-style dialog boxes. The result—1-2-3 for Windows is now one of the most powerful and easy-to-use spreadsheets ever developed.

And, if you're a spreadsheet user who needs to access external databases, 1-2-3 for Windows remains unmatched—particularly if you need relational capabilities. The fact is, Excel's data access capabilities rest on a third-party product that offers limited relational capabilities. Which explains why Corporate Computing (August 1992) recently wrote that "for the experienced 1-2-3 database user, 1-2-3 for Windows with DataLens® is the front-end tool of choice."

In fact, not only do people prefer our product, but according to the ComputerWorld Spreadsheet Brand Preference Study, more people prefer our company. Lotus beat everybody (including Microsoft) for the awards of "best company to do business with" and "company that offers the best service and support."

Before you decide on a spreadsheet, remember—no one knows more about spreadsheets—and the people who use them—than Lotus.

For more information visit your Authorized Lotus Reseller or call us today for your free auto demo at **1-800-TRADE-UP, ext. 7074.*** After all, hype only goes so far.

Lotus 1-2-3 for Windows

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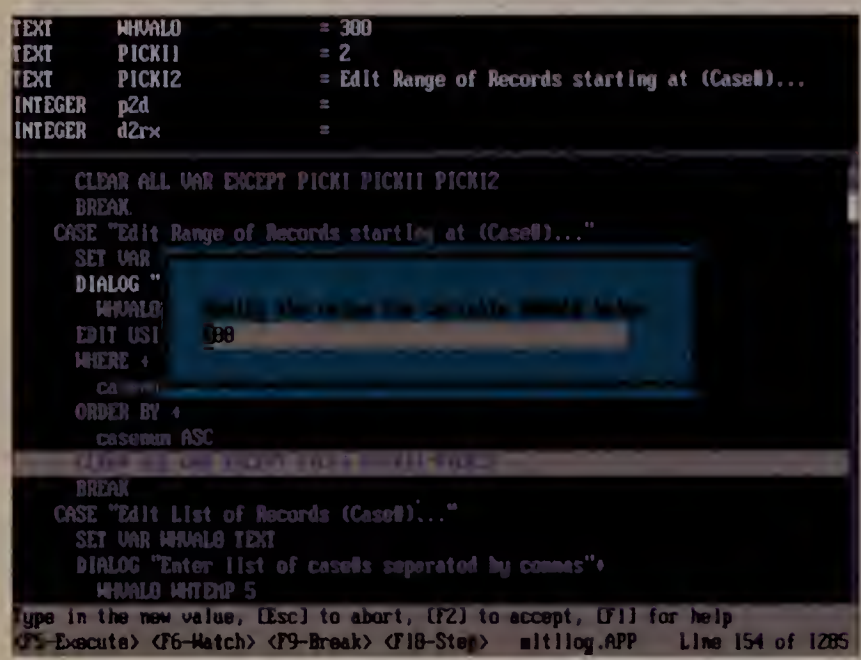
R:BASE 4.0 Gets a Speed Boost

While heavy hitters Microsoft and Borland may soon release *Windows* data base programs, Microrim has taken a tried-but-true tack with a speedy new version of its DOS product.

Unlike the last major update to *R:BASE*, the changes in version 4.0 mainly address developer concerns, including sluggish performance and the lack of a debugger. In informal testing, *R:BASE 4.0* was 10 to 30 percent faster than version 3.1e on queries and reports, 3 times faster in bringing up data entry forms, and 25 times faster in multifile batch updates. For networked applications, Microrim promises more dramatic speed increases thanks to an overhaul of the multiuser locking scheme.



Modifying the value of a variable while debugging an application is easy using R:BASE 4.0's new debugger.

Developers can now benefit from the watchful eye of *R:BASE*'s debugger. An improved update function does relational updates, replacing inches of program code with a single speedy command. Other changes include more fields per data base—upped from 800 to 16,000—support for multicolumn pop-up menus in forms, a mousable editor, and improved support for data base–level referential integrity (which helps ensure that key fields in one file match values in another).

During testing, *R:BASE* intermittently refused to load under *Windows*. Microrim says that the problem, which occurs only with certain configurations, is related to the DPMI extender technology that allows the program to run in protected mode under *Windows*, and the company hopes to have a fix available soon for no charge.

Microrim will also release an equivalent nonextended version of *R:BASE*, version 3.1d—for users who don't have the minimum 386SX-based PC, 2.5MB of memory, and 5MB hard disk—and a 32-bit character-mode OS/2 2.0 version.

Version 4.0 is a welcome, developer-friendly update that adds 32-bit muscle to a venerable data base. It lists for $795; current users upgrade for $149.

—Paul Litwin

R:BASE 4.0

WINDOWS This 32-bit version of R:BASE is faster and includes a debugger.

Microrim, Inc.
206/649-9500,
206/746-9350 (fax)
List price: $795
Reader service no. 625

Brainstorming for the Big Idea

Say you're responsible for developing a marketing strategy for a new product or putting together a major presentation about your department. In either case, you'll be judged by the quality of your ideas. *IdeaFisher* can help. This top-notch brainstorming package is a massive cross-referenced data base that deluges you with ideas.

IdeaFisher has two main components. You can start with QBank, which includes nearly 6000 questions to help clarify your thinking about a problem. Or you can move directly into IdeaBank, which offers some 61,000 words and phrases to help you generate ideas.

I decided to see how much help the program could give me in my attempt to describe a UNIX accounting system whose key feature is that it's *modifiable*, which is the word I typed in. IdeaBank presented me with seven major idea categories; I chose one and was presented with 1196 ideas in nine subcategories. From this wealth of information, I decided that the best terms for my purposes were *bend or break*, *fluid*, *catalyst*, *perpetual motion machine*, and *set in your ways*, which I used in writing some of my promotional materials.

Other brainstorming programs may guide your thinking with directed questions, but *IdeaFisher* has the richest collection of ideas. Esther Dyson, editor of the *Release 1.0* newsletter, probably described it best: "IdeaFisher simply supplies a thinker with associations he [or she] knows and understands but may have forgotten. It says, If you're thinking about Russia, did you think about Gorbachev, and Red Square, and piroshki, and Communism," and so on down the line.

IdeaFisher 4.0's interface improves over the previous version's with movable windows and zoom icons. The program lists for $595; upgrades are $99. An optional Strategic Planning module sells for $99, a Presentation Planning module for $79.

—Reid Goldsborough

IdeaFisher 4.0

This mammoth data base can help stimulate your creative juices.

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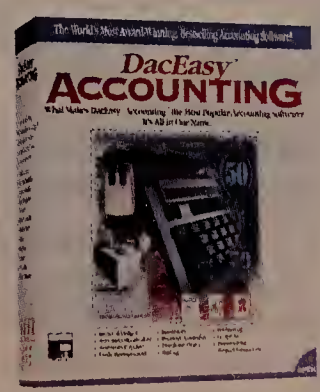

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Computers in Accounting-April/May 1992

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Media Code: PCW

Circle 94 on reader service card

The only notebook with a tilt & swivel display. Great for sharing data or keeping it private. Easily adjusts for perfect viewing.

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We asked our customers what it is they want in the perfect notebook. The first thing they told us is that most notebooks look like a cigar box with a lid. They told us they wanted not only good looks, but things like great power *and* great battery life. Lightweight too, like five pounds and change. And the keyboard should be effortless to use. The entire product had to be extremely durable. And that was just for starters.

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We listened well. Then we got down to work. For the chipset and CPU we selected the Intel 25MHz SL. We then built in a high-speed 64K SRAM cache as standard. We know this system might well replace a desktop for many users.

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And then there is the "floating" screen. When you're facing your new ZEOS Freestyle/SL, the screen actually appears to "float" in the air in front of you. It's the only notebook that can really be used sitting on your lap!

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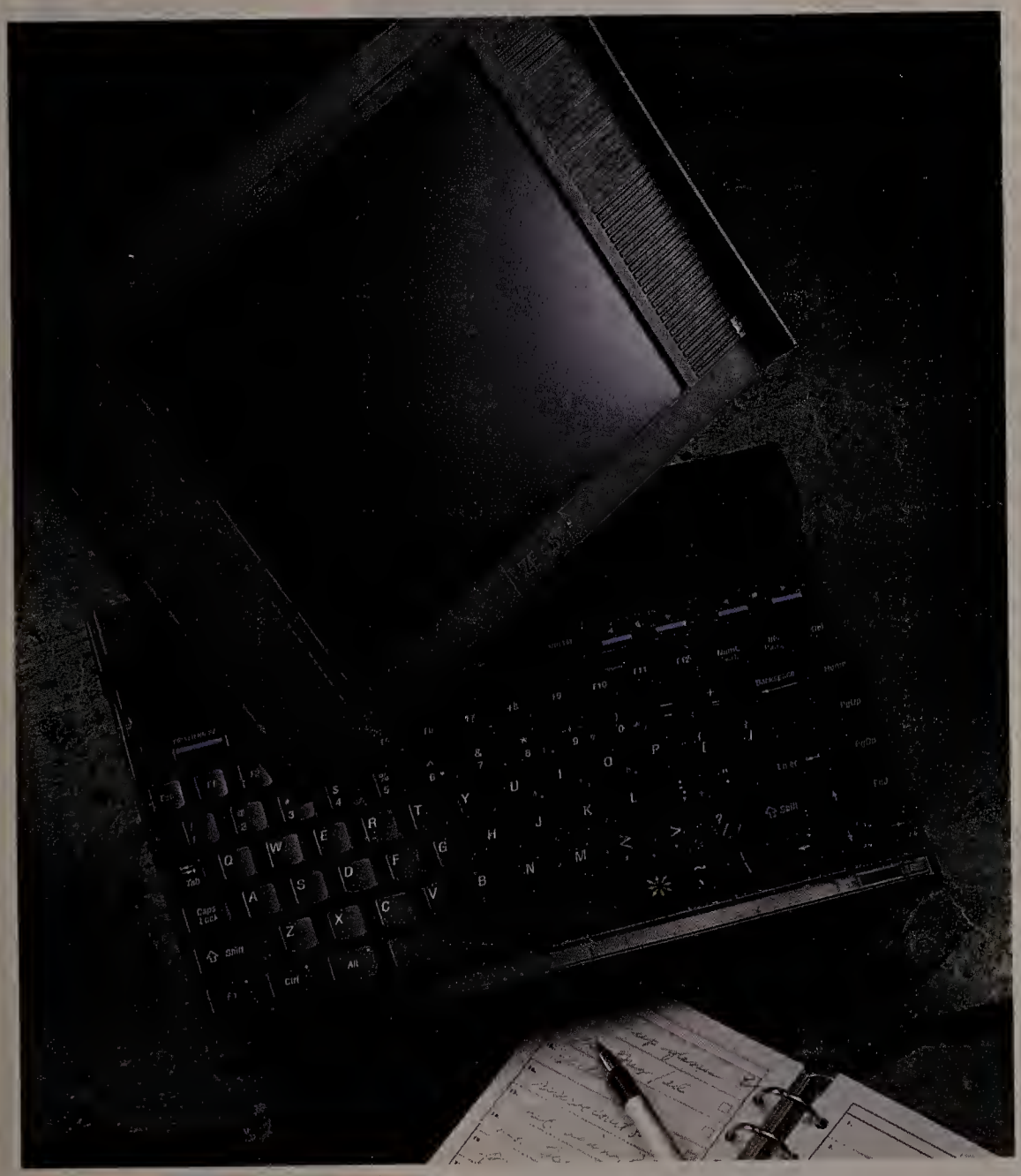
Built-in mouse key provides easy cursor control. Leave those bulky mice behind!

This sliding port door won't break off or come loose. Saves your fingers too.



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PC Magazine recently surveyed notebook users for their Service and Reliability issue. Their findings? "Only ZEOS portable PCs achieved significantly higher-than-average ratings in all four categories." The categories were reliability, future purchase plans, repair service satisfaction and technical support. And remember, ZEOS technical support is 24 hours a day, 365 days a year, toll free. And we back your new ZEOS Freestyle with our 30-Day Absolute Satisfaction Money-Back Guarantee, One Year Limited Warranty and more.

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Organizer, a PIM for the Rest of Us

You'd think that in an already bulging and confusing market, a new personal information manager would solicit yawns, but *Lotus Organizer* is different (and useful) enough to merit a careful look.

You'll find *Lotus Organizer* a highly customizable PIM that avoids the all-too-common failing of forcing you into one vision of time and information management.

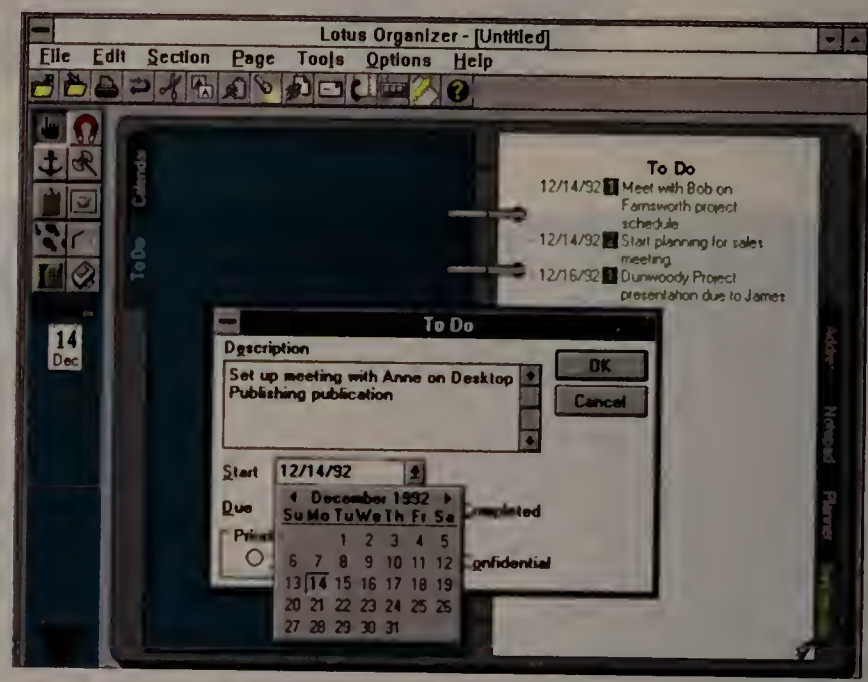
Organizer has the usual PIM categories of calendar, to-do, address, and notepad, as well as a sophisticated graphical planner and a section that tracks recurring events. Where *Organizer* really shines is in its ability to let you interconnect pieces of information in a logical and straightforward way. Using the anchor icon, it's simple to relate, say, a phone book entry to a to-do note or an appointment.

Organizer has the requisite auto-dialer and is especially talented at keeping track of incoming and outgoing telephone calls. It also has *cc:Mail* and *Lotus Notes* support for sharing calendars over a LAN.

Lotus Organizer

WINDOWS **A customizable, powerful PIM.**

Lotus Development Corp.
800/343-5414,
617/577-8500
List price: $149
Reader service no. 327



Lotus Organizer extends the familiar ring-binder PIM metaphor.

The package prints data in a wide array of formats, supporting Rolodex cards, labels, Day-Timers, envelopes, and Filofax.

At $149, *Lotus Organizer* is one of the few PIMs that's useful right out of the box.

—Stan Miastkowski

FALLING TO PIECES LOOKING FOR THE ULTIMATE MULTIMEDIA UPGRADE?

Organize Your Images With ImagePals

When you've got a passel of scanned photos or images, you need one of three things: a Zen-like ability to find meaning in cryptic file names, the patience to load image file after image file looking for the right one—or *ImagePals*.

ImagePals is actually three programs in one: a 24-bit image editor, a screen-capture utility, and an image manager and viewer. The image editor, called Enhancer, and the screen-capture program, Capture, are perfectly serviceable utilities. Enhancer is an entry-level image editor, but it does allow you to select an area by color and apply changes only to the selected area. It will even maintain an image's texture when you change its color. Capture's only real limitation is that it takes screen shots only from *Windows* programs. It will capture any portion of the screen to a work space or to a file and name any number of files consecutively using your file name specifications. But what raises *ImagePals* above the rabble is Album—the image manager and viewer module.

Album eliminates the confusion and nuisance of tracking image files. You don't have to decipher eight-character file names, because Album lets you view thumbnail versions of your images. The thumbnail is a low-resolution copy of the original image, which is stored in the file format of your choice, from TIFF to the popular compression format JPEG.

If you'd like to store photos of your company's employees, you could create an "album" for each department. Drag the Marketing album off the "shelf" and scroll through a stack of thumbnail views of your photos. Without opening a single file, you can see each person's picture.

You can right-click on the thumbnail image to get file information—size, date created, and notes—and double-click to enlarge the thumbnail. You can drag and drop images between albums or execute commands, such as print, on a whole album. And since the three modules are integrated, you can drag a thumbnail—or a whole album—onto the Enhancer icon to launch Enhancer and open the file(s) for editing.

For a utility, $249 may seem steep; but if time is money, this three-in-one comes cheap.

—Christina Wood

ImagePals

WINDOWS **The Photo-Styler people offer a program that edits images and organizes them for easy access.**

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800/858-5323,
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Reader service no. 628

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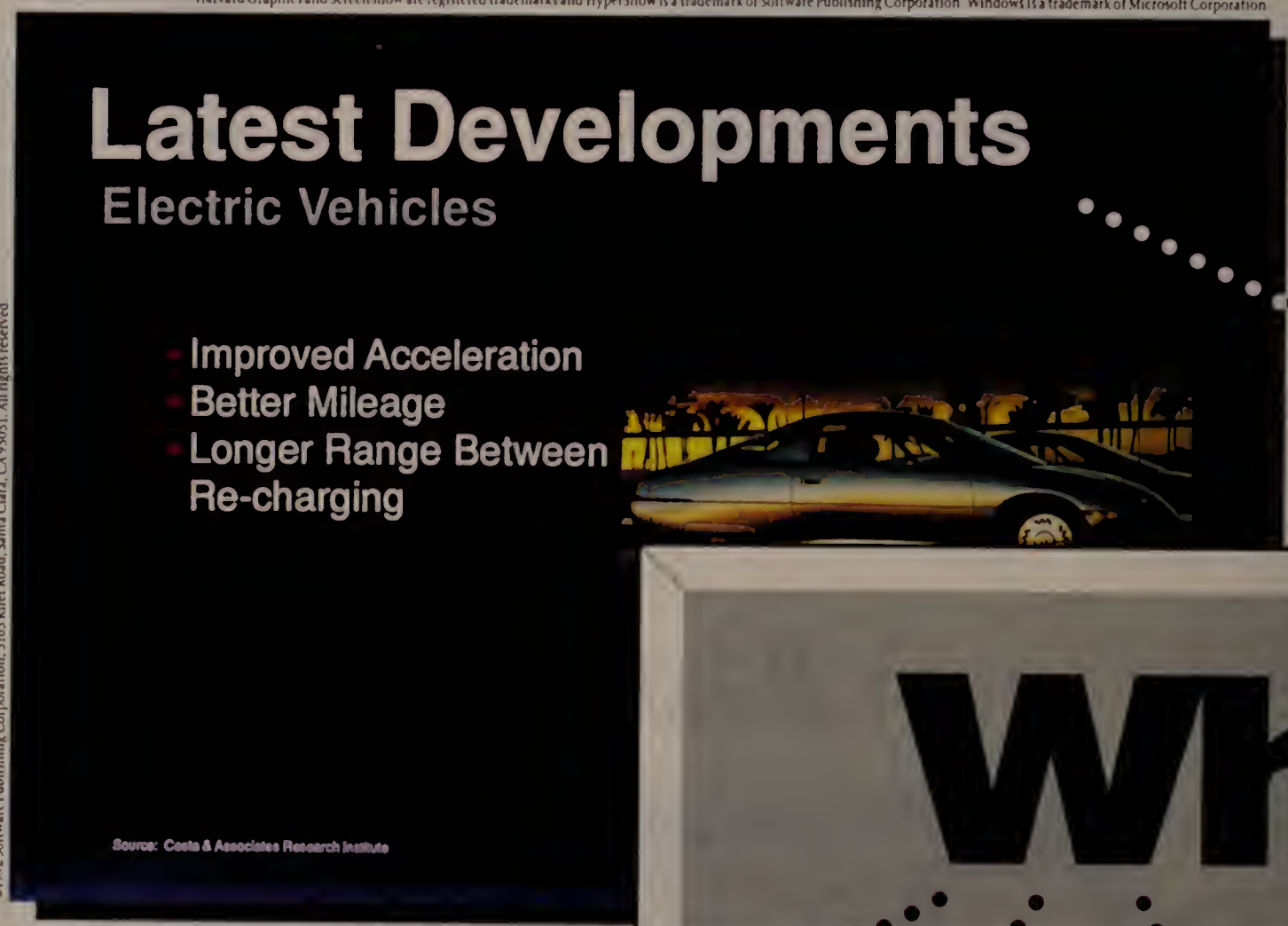

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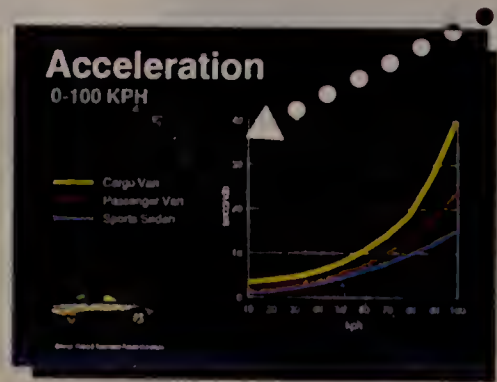
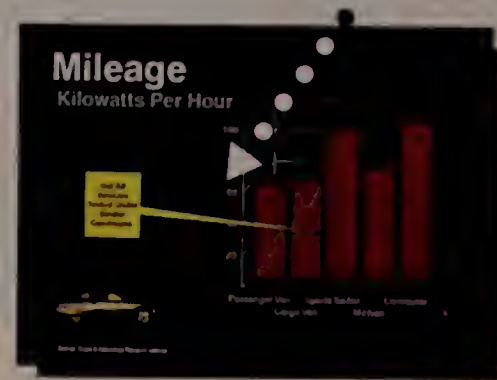
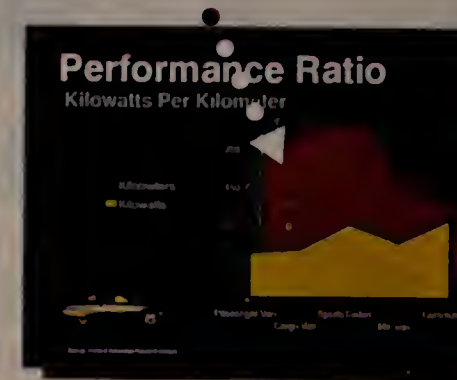
Set up simple HyperShow links between slides in your on-screen presentation.







And with the click of an on-screen button, you can jump to different slides to answer audience questions.

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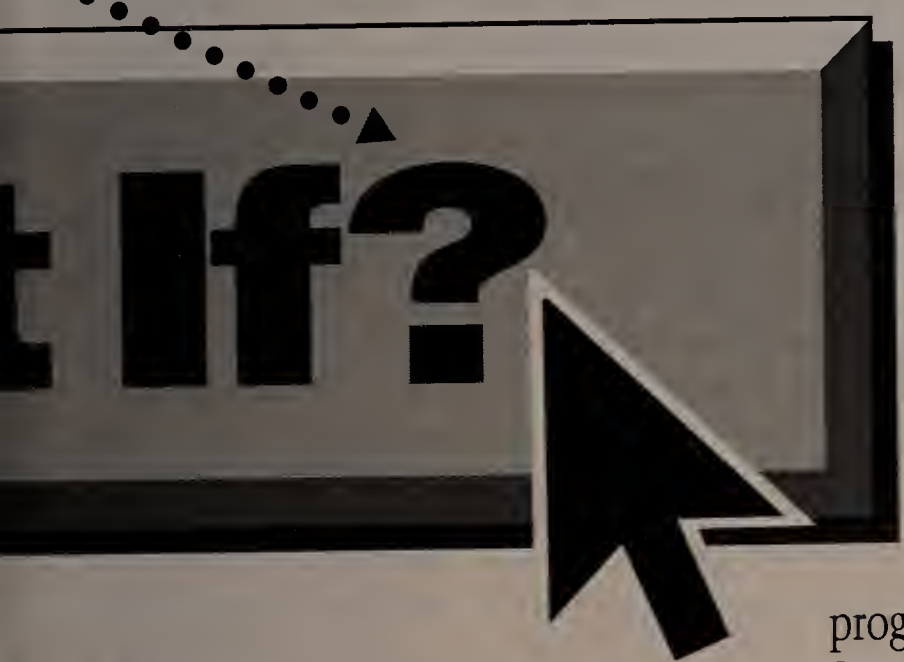

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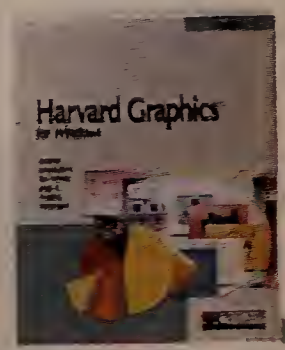
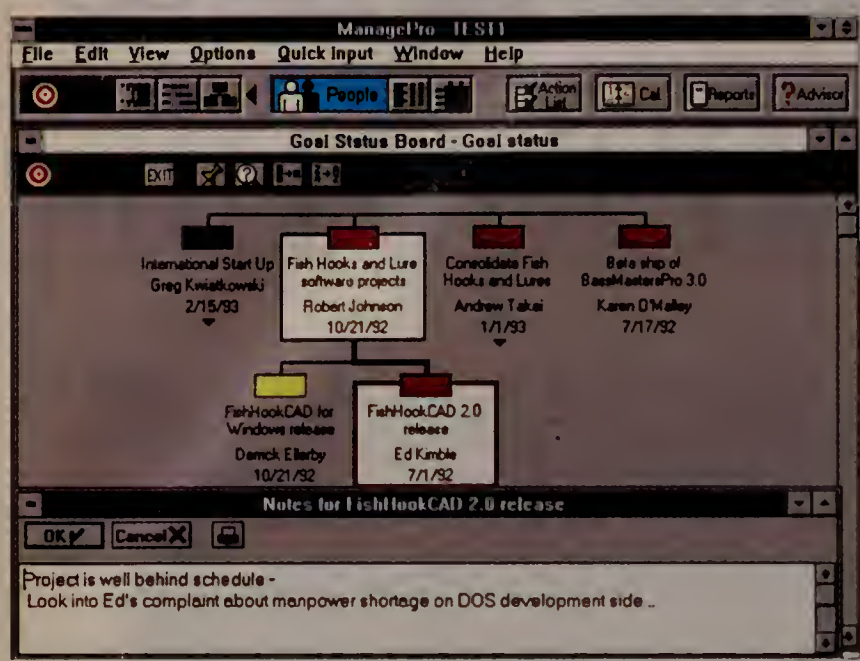


SPC SOFTWARE PUBLISHING CORPORATION

ree Harvard Graphics for Windows demo disk.

Manage Personnel and Projects Concurrently



ManagePro for Windows' Goal Status tool lets you quickly check the status of projects and visualize important business relationships.

ManagePro for Windows is a $395 professional management program that takes an integrated, people-oriented approach to managing projects and personnel. Moving beyond conventional tracking and note-taking software, *ManagePro* offers a suite of goal-setting tools to help managers review employees' performance and coordinate their actions.

Using intuitive spreadsheet-like forms for data input and viewing, managers can track corporate goals, take detailed notes on personnel and projects, and associate individuals with specific projects. The program also lets you define a set of goals for employees, complete with start and finish dates for projects, interim review schedules, and notes on rewarding employees for accomplishing specified tasks.

ManagePro's five sections include a status board and planner for goals and personnel, and a time line for viewing progress. You can arrange projects and people in logical hierarchies within the sections, with top strategic goals, such as increasing market share, predicated on accomplishing lower-level goals, such as introducing new products and bolstering sales staff.

The program also includes a calendar that can be displayed by year, month, or week. An event such as an annual employee review that's defined in one *ManagePro* tool automatically appears on the calendar, and you can reschedule it simply by dragging its marker to another day. You can create customizable templates and reports in *ManagePro* or call on a number of printable reports in each tool to output data.

ManagePro even goes so far as to offer professional advice through its Management Advisor function. This context-sensitive management help screen is simple to work through and displays helpful tips on a wide variety of personnel issues.

The program can import and export data in popular file formats like *dBASE*, *Excel*, and *1-2-3*, but doesn't support data sharing under DDE or OLE. It has basic network functions and permits variable access privileges for multiple users. Network modules for *ManagePro for Windows* are $99 per person.

—Michael Desmond

ManagePro for Windows

WINDOWS **This easy-to-use package integrates personnel and project management to help you achieve business goals.**

Avantos Performance Systems
800/282-6867,
510/654-1276 (fax)
List price: $395
Reader service no. 629

Visual BASIC Without the Graphics

Microsoft's aging character-based BASIC compilers are about to get a boost. Taking cues from the tools available in *Visual Basic for Windows*, Microsoft will release updated standard and professional versions of *Visual Basic for MS-DOS* this fall.

The new versions add *Visual Basic for Windows'* interface painting tools, *Windows*-style menus, mouse support, event-oriented code, plus form- and control-based tools. Developers can step up to these additional capabilities at their own speed by adding new features incrementally to older code.

An included translation utility moves applications back and forth between the *Windows* and DOS versions, although graphics-heavy *Visual Basic for Windows* applications will need considerable revision.

During development, you pick interface elements, such as forms, dialog boxes, and drop-down lists, from a toolbox. Drop-down menu design and mouse support are built in. You then write code for user events such as mouse clicks and keystrokes. Both versions create stand-alone EXE files and can link with object libraries written in other languages.

The Professional version provides a powerful suite of diverse features, including on-line help and charting tool kits, plus tools for creating installation programs. You also get additional custom controls, 386/486 optimization, and a kit for creating custom controls for the language.

The Standard package will retail for $199, the Professional version for $495. Upgrades from any Microsoft or Borland language will cost $99 and $199, respectively.

—George Campbell

Microsoft Visual Basic for MS-DOS

BASIC developers get Windows-like programming tools for the DOS environment.

Microsoft Corp.
800/426-9400,
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206/936-7329 (fax)
List price: $199
Reader service no. 630

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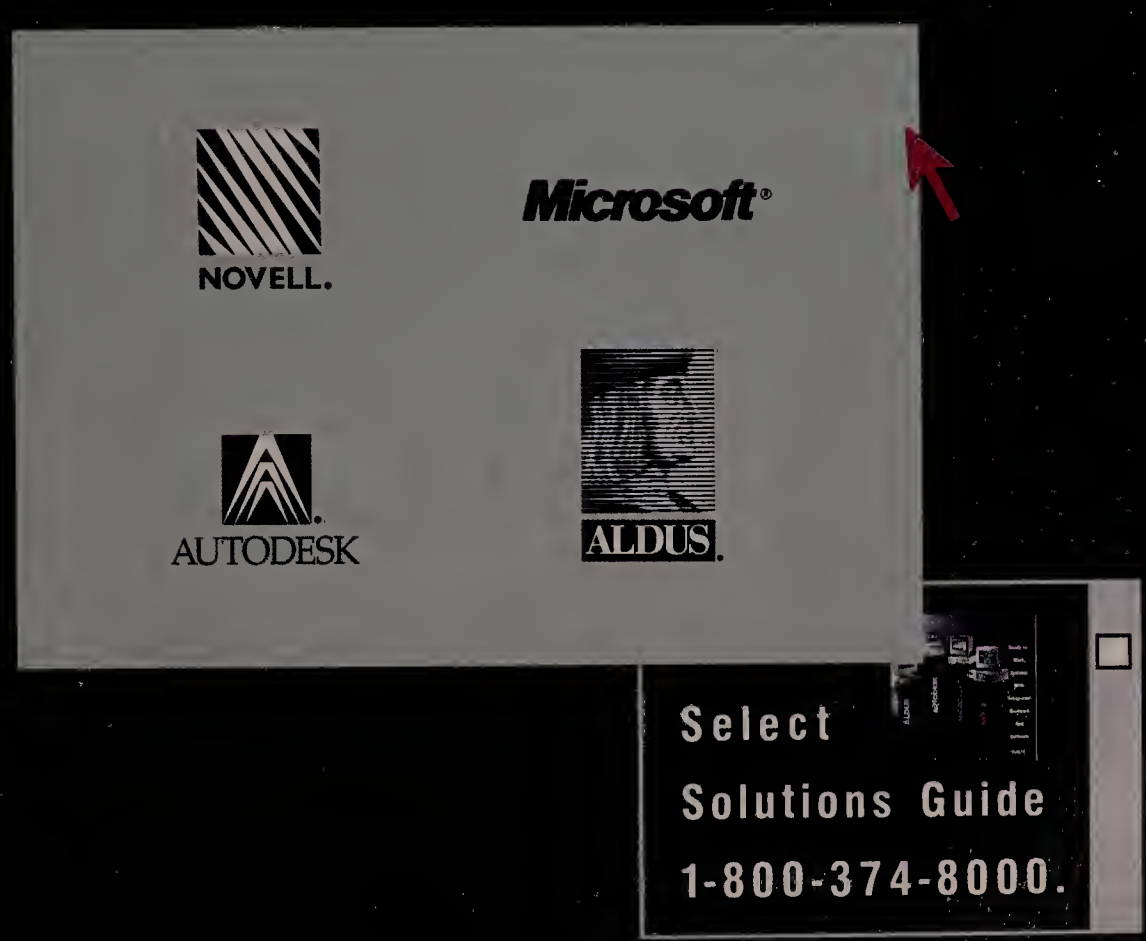

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Features: ▪ PowerMate® 486SX/-25I server ▪ 8MB RAM ▪ 3 free ISA slots ▪ 240MB hard drive ▪ MultiSync® 3FGx™ monitor ▪ MS-DOS® 5.0 and Microsoft® Windows™ 3.1 ▪ Novell® NetWare® 3.11 software ▪ Eagle NE2000 Ethernet® co-ax or NE2000T 10 BASET 16-bit network interface card

Benefit: Instantaneous communication throughout your office.

Price: From $5,319 (for system described); for 50 to 250 users.

■ Select Solution No. 18 NEC / Aldus

Application:
Desktop Publishing

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- 240MB hard drive
- MultiSync® 5FG™ monitor
- Matrox® Impression 1024™ Color Graphics Board
- MS-DOS® 5.0 and Microsoft® Windows™ 3.1
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Benefit: High-performance integration of text and graphics. Right out of the box.

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Application:
Business Computing

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- 8MB RAM
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- 240MB hard drive
- MultiSync® 3FGx™ monitor
- MS-DOS® 5.0 and Microsoft® Windows™ 3.1
- Microsoft Office for Windows (Microsoft Excel 4.0, Word 2.0, PowerPoint® 3.0)

Benefit: Increased productivity in the Windows operating environment. In a turnkey, ready-to-work system.

Price: Select Business Solutions from $2,739. System shown: $3,649.

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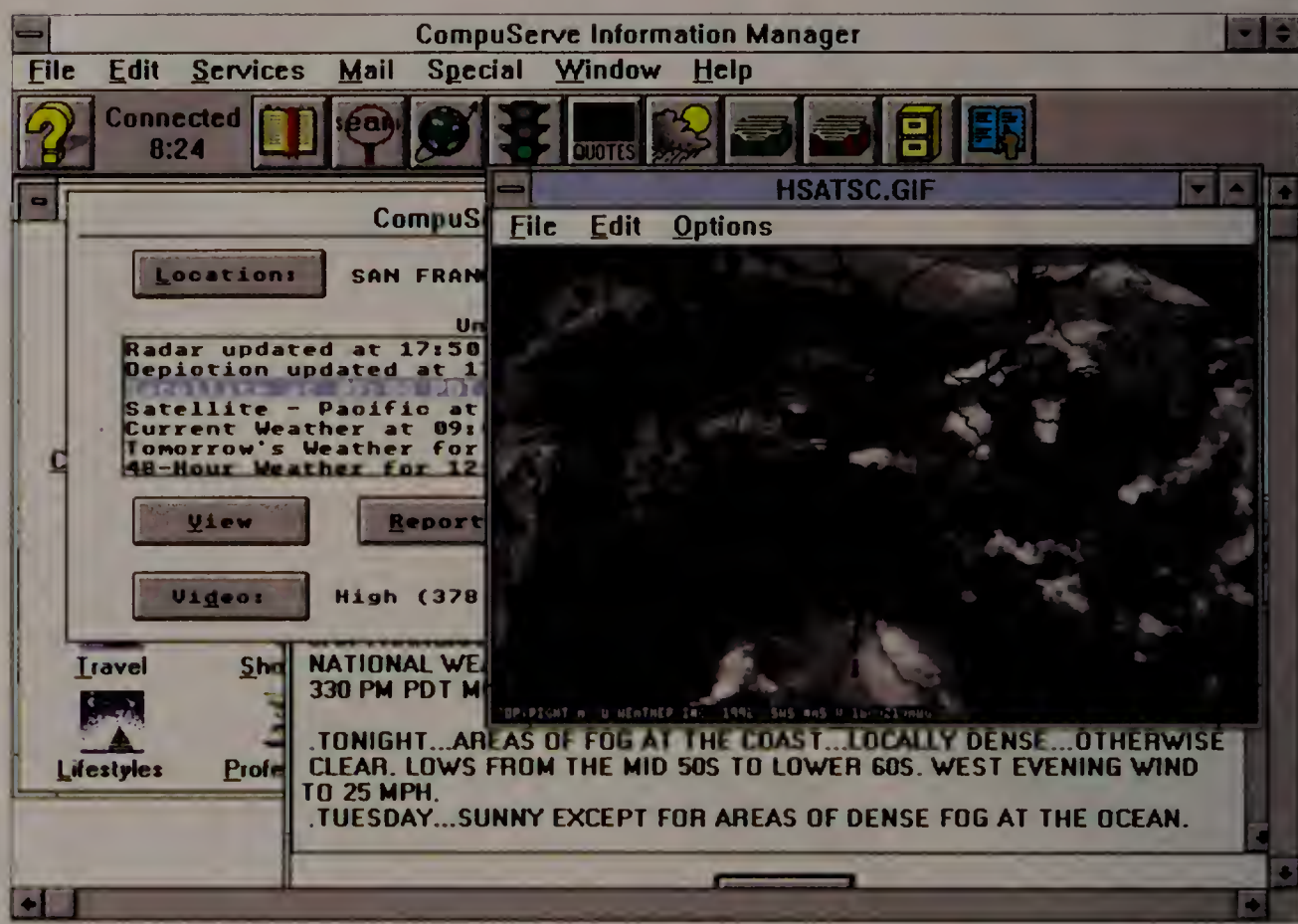
Circle 203 on reader service card

Open a Window Into CompuServe

CompuServe is the oldest on-line service around and has a large body of active, devoted members. But it also has an interface that harks back to the DOS days of yore. A number of front ends for CompuServe make it easier to navigate on line. But now a new *Windows* front end makes logging on even less daunting.

CompuServe Information Manager for Windows forever banishes the system's unfriendly command-line prompt. Click on a nifty CompuServe Globe icon from Program Manager and launch into the new graphical, button-laden CompuServe environment. You can write messages off line and store them in an out-basket. To send your messages, just click on the out-basket, and *CIM for Windows* logs on and flies over to the mail section without further prompting (although if you're using a 2400-bps or slower modem, *fly* might not be the word you'd choose).



While getting the local weather reports, you can view weather maps in CompuServe Information Manager for Windows with the GIF image viewer. Use the Clipboard to paste them into your Windows app files.

Once on line, finding your way around is a simple matter, especially if you're familiar with the *Windows* environment. And if connect charges concern you, you can breeze through your favorite forums, mark messages or files that look interesting, and log off. *CIM for Windows* will automatically download everything to your filing cabinet and then disconnect.

Can you teach *CIM for Windows* to send your mail, visit the forums you like, mark all new messages, and dial up at 3 in the morning while you sleep? No, you can't—at least, not until CompuServe's *Navigator for Windows* is available sometime in 1993. Much like *Navigator* for the Mac, *Navigator for Windows* will allow you to do automated batch access or unattended visits to CompuServe. *CIM for Windows* and *Navigator for Windows* will be able to read one another's address books, so you won't have to start all over next year or even commit to one interface.

Mobile Log-On

Travelers with laptops will appreciate *CIM for Windows*' ability to remember numerous log-on settings. You can create a setting for San Francisco, say, and one for Boston. When you're in the East, choose Boston from a pulldown menu, and *CIM for Windows* changes the phone number and any other setting you have specified.

When you go into a forum, *CIM for Windows* presents an additional button bar that automates common forum commands. For instance, if you want to send a message, click on the Create Message tool. Or if you don't want to listen to the ravings of some on-line lunatic, click on the Squelch button. You can also take advantage of *Windows*' Clipboard, copying and pasting from one forum to another or copying graphics from the CompuServe screen and pasting them into your applications. With the decoder, you can view weather maps and other graphics on line or copy them to the Clipboard.

CIM for Windows uses CompuServe's proprietary Host Micro Interface protocol, which confirms data between the two computers rather than modem to modem, so you can be sure your data is error free. It also compresses data automatically for faster transfers. *CIM for Windows* has a built-in decoder for GIF, the graphics file format used by CompuServe.

You will be able to download *CIM for Windows* in December from CompuServe for a one-time fee of $10 to $25 (at press time, the price had not been determined). CompuServe will offset that fee with a usage credit. New membership packages will begin shipping with *CIM for Windows* in February or March for about $40.

—Christina Wood

CompuServe Information Manager for Windows

WINDOWS **CompuServe's new front end takes advantage of Windows' graphical interface, Clipboard, and mousability.**

CompuServe, Inc.
800/848-8199
List price: not available at press time
Reader service no. 631

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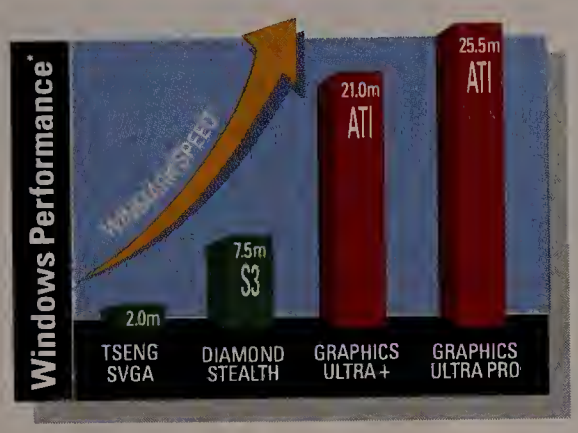
mach 32



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Copyright © ATI Technologies Inc., 1992. All company and/or product names are trademarks and/or registered trademarks of their respective manufacturers. *Winbench 2.5 on 486-33 at 1024 x 768 / 256 colors at 60 Hz. **Multimedia drivers available 11/92. ***Suggested Retail Prices in US$. Dealers may sell for less. Prices subject to change without notice. Awards based on award-winning technology of GRAPHICS ULTRA and VGA WONDER.

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Kathryn Mary Olsen
Professional Trainer

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Consultant

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Katherine J. Bartz
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Scott McGuirk
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19. "User-obvious, painless invoicing and accounts receivable."
Valon Cross
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Donald K. Burden
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Samuel Moeller
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Ad Code: PWBRT

Hayes Brings Smartcom to Windows

Although not the first *Windows* communications program to reach store shelves, *Smartcom for Windows* is certainly one of the most thoughtful. Its interface has been carefully designed to make getting started easy for novices, yet it supports all the advanced features available in the DOS version, including a powerful scripting language and support for many file transfer protocols.

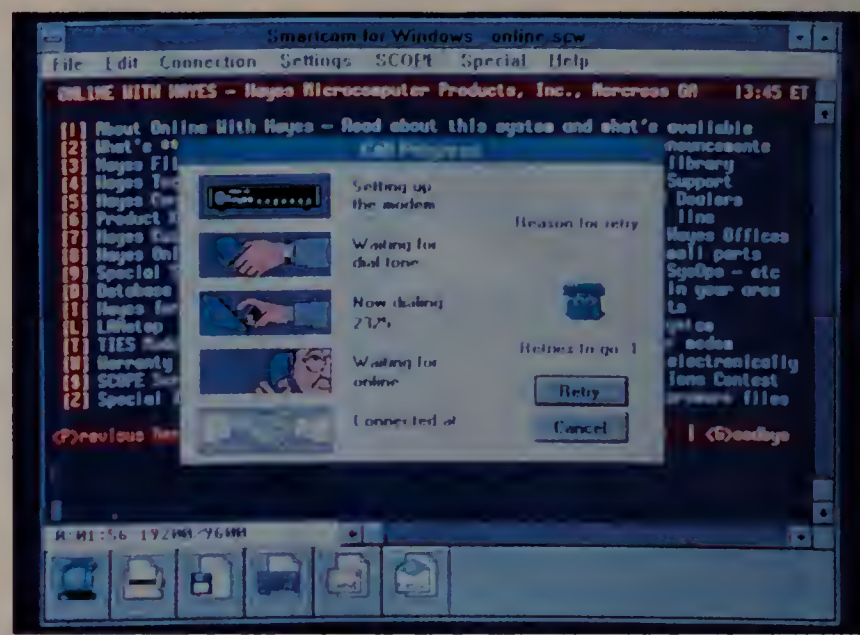
Beginners will appreciate the ease with which they can get started. Like many *Windows* applications, *Smartcom* features a movable button bar that makes performing common tasks a one-click job. You can use the button bar to dial a number, send and receive files, print an on-screen session, save a session to a text file, and accomplish other tasks that you can assign to unused buttons. A graphical log-on screen guides beginners through the process of connecting with on-line services such as CompuServe.

The program's text editor includes many features you've come to expect from your word processor, including move, copy, find and replace, center, and undo. Its SCOPE (Simple Communications Programming

Smartcom for Windows

WINDOWS Hayes Microcomputer's newest communications program is powerful but surprisingly easy to learn.

Hayes Microcomputer Products Inc.
404/441-1617,
404/441-1213 (fax)
List price: $179
Reader service no. 632



Smartcom for Windows takes advantage of Windows' graphics capabilities to guide you through log-on procedures.

Sales manager Susan Briggs has innovative ideas. But you'd never know it when she only has an hour to prepare.

Environment) scripting language, also used in Hayes's DOS-based *Smartcom Exec* and *Smartcom III*, allows you to automate repetitive tasks such as logging on to on-line services and triggering events at specified times of day. According to Hayes, SCOPE scripts written in *Smartcom Exec* and *Smartcom III* will run in *Smartcom for Windows*. The program also supports Hayes's high-speed ESP serial board.

Smartcom for Windows costs $179. *Smartcom EZ* users can upgrade for $75; *Smartcom Exec* and *Smartcom III* users for $50. Users of any other DOS or *Windows* communications program can switch for $80.

—Jeff Bertolucci

Power to the Portable Modem

Portable-computer technology has been leaping ahead, especially in the area of sophisticated power management. You can sometimes run your notebook for nearly a full workday before going in search of an AC outlet. But the same can't be said for portable modems, most of which run for only 2 to 3 hours off 9-volt batteries.

Omron's Impala 24/96 Fax/Data modem is an elegant and eminently portable little package (4.4 by 3.4 by 0.9 inches) that weighs about 8 ounces with batteries. Omron claims the Impala will run 10 to 12 hours on a set of batteries, and our informal tests indicate their claims are true.

The real secret to Impala's longevity lies in its adoption of power management techniques used in notebook computers. When you're not using the modem, it immediately goes into a sleep mode that uses a minuscule amount of power. As soon as the serial interface is active, it awakes. An AC adapter is also included.

Under the flip-top lid is a full set of modem controls, including seven LED status indicators, a useful feature often missing from portable modems. There's also a built-in speaker.

The Impala has virtually all the features necessary for on-line 9600-bps fax and 2400-bps data communications, including MNP-5 and V.42bis compatibility for error correction and data compression. It comes with a full complement of fax and data communications software, including Delrina's *WinFax Lite* and *DosFax Lite*, and *BitCom*.

By integrating power management into this $399 modem, Omron makes keeping in touch on the road easier than ever.

—Stan Miastkowski

Omron Impala 24/96 Fax/Data
Portable modem with sophisticated power management.

Omron Office Automation Products, Inc.
408/727-1444,
408/970-1149 (fax)
List price: $399
Reader service no. 633

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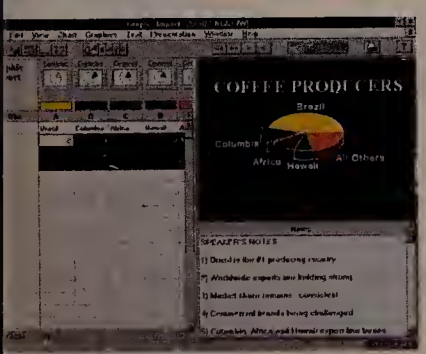

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Try the Cougar!

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"We took out our old system a year ago and installed Act Plus. We use Act Plus all day long. It's the best software for business that I've ever run across." — Alumaline Corp. of America

"After evaluating several others — even some costing over a thousand dollars — we chose Act Plus because of its superb accounting, full integration and flexibility. It easily handles our retail and wholesale operations and our multiple locations. And we've sure cut down on our CPA and tax preparation costs." — Vertek, Inc.

"We looked at several other packages, but when we found Act Plus we didn't have to look any further. It's fast, flexible and easy to use. I'd recommend it to anyone." — Water Sport Marine and Ski

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(208) 343-0267 Fax

Circle 56 on reader service card

WordStar for Windows 1.5 hits the bull's-eye with its new Windows 3.1 support: It lets you access TrueType fonts and use OLE data links.

WordStar for Windows 1.5

WINDOWS The latest version of *WordStar for Windows* supports *Windows 3.1*, so you can access TrueType fonts and take advantage of *Windows'* drag-and-drop capabilities. It also features client support for Object Linking and Embedding (OLE), enabling you to create live data links with other *Windows* applications that support OLE. Tables are now easier to create because they automatically adjust to fit the size of imported files. Included in the package is version 2.0 of *Correct Grammar for Windows*, and current *WordStar for Windows* users also receive a free copy of *Correct Writing for Windows* when they upgrade to version 1.5. The package retails for $119. *WordStar for DOS* users can upgrade for $99; registered *WordStar for Windows 1.0* users pay $29.95. WordStar Int'l, 800/227-5609, 415/883-1629 (fax).

Reader service no. 641

RingRite+

This compact external unit (5½ inches long, 4½ inches wide, 1½ inches deep) lets you share a single phone line among three devices, including modems, fax machines, and telephones. RingRite+ works with the distinctive ringing service now offered by regional phone companies. With this service, you can assign up to three phone numbers to one line. When you receive a call, RingRite+ deciphers the ring and routes the call to the appropriate device. Priced at $119, RingRite+ plugs into any standard RJ-11 phone jack and includes three input jacks for your communications devices. Management Products, Inc., 800/245-9933, 303/465-0237 (fax).

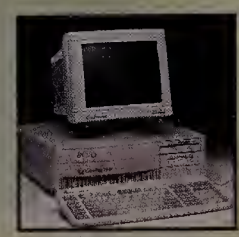
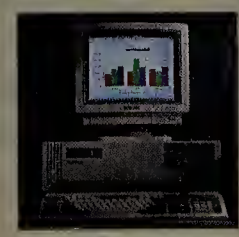
Reader service no. 637

Tandberg Data Panther 2000

Aimed at the high-end workstation and network-backup market, the new Tandberg Data Panther 2000 is the first DC600 QIC tape backup system to store 2GB of uncompressed data on a single tape. With compression, this new ¼-inch cartridge drive should be able to handle 4GB or more of data, depending how much your files can be compressed. The Panther 2000 drive uses the new QIC-2GB format, but its capability to read and write to other

When Buyers Rate ZEOS®.

Support: How Mail-Order Vendors Stack Up

What Buyers Say	CompuAdd Corp. *CompuAdd 325* (with 32K-byte cache) $2,881	Dell Computer Corp.* *Dell System 325P* (no cache) $3,144	Gateway 2000 *Gateway 2000 25MHz 386* (with 80M-byte hard drive, 32K-byte cache) $2,090	Northgate Computer Systems Inc. *Northgate Elegance 386/25* (with 64K-byte cache) $2,839	Zeos International Ltd.* *Zeos 386-25* (includes AmiPro, 1-2-3 for Windows, no cache) $2,540
How long does it take to get a support representative on the phone? (most frequent answer)	1 to 5 minutes	1 to 5 minutes	more than 30 minutes	1 to 5 minutes	1 to 5 minutes
Technical competence of support representative (10 is best)	7.5	8.1	8	7.8	8.1
How long does it take for the vendor to solve your problem? (most frequent response)	Immediate	1 to 2 days	2 days or more	Immediate	Immediate
If your job depended on it, would you recommend buying more PCs from this firm?	12 yes 1 no	13 yes 2 no	12 yes 2 no	10 yes 5 no	15 yes 0 no
Overall rating for service and support (10 is best)	8.3	7.8	7.5	7.8	8.6

NOTES: Customer satisfaction results were compiled from PC Week's survey of PC managers whose organizations have purchased mail-order PCs. 15 customers of each vendor were surveyed.

Prices and specifications shown were supplied by vendors, each of which was asked for a quote on its lowest-priced 25Mhz 386 machine with 4M bytes of RAM, dual floppies, a 100M-byte hard drive, 14-inch Super VGA monitor, keyboard, mouse, Windows and DOS 5.0. Any changes to the configuration or no-cost options are shown. Prices were gathered by calls to each vendor between Oct. 3 and Oct 14, and include tax and shipping charges.

*System is upgradable.

PWKCHT-PCW-9211

Chart Reprint from October 21, 1991 issue of PC Week. *Reprinted by permission.*

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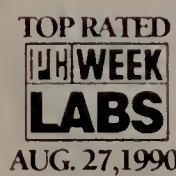

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Circle 67 on reader service card

Quick Takes

DC600 QIC formats protects your investment in older tapes. The Panther also promises to be quick-footed: Tandberg rates its data handling at an impressive 18MB per minute. It comes in an internal DOS model, which lists for $3100, and a $3395 external DOS/Novell system. Third-party software options include Sytron's *SyTOS Plus*, *ARCserve*, and *Retrospect*. Tandberg Data Inc., 805/495-8384, 805/495-4186 (fax).

Reader service no. 635

Cardinal Modem Value Pack

Remember when 2400 bits per second was the cutting edge of modem technology? How soon things change: 2400 bps now represents the low end of the communications spectrum, and you can pick up a 2400-bps unit for pocket change. Cardinal Technologies' Modem Value Pack includes a 2400-bps internal modem and lists for $49.95, with street prices likely to drop below $30, according to Cardinal officials. This modem bundle includes Prodigy service software as well as *QuickLink II*, a simple communications program for sending and receiving data files and logging on to BBS's and other on-line services. You'll find Cardinal's Modem Value Pack in computer superstores and other retail outlets that carry computer products. Sorry, no fax capabilities with this low-cost find. Cardinal Technologies, Inc., 800/233-0187, 717/293-3000, 717/293-3055.

Reader service no. 636

Forest & Trees 2.0d

WINDOWS Channel Computing is expanding the kinds of data you can access with its *Forest & Trees* executive query program, and it's heading in two directions at once. At one extreme, you can now query data stored on VAX Rdb/VMS minicomputers; at the other, the program now reads *Q&A* files. In between, *Forest & Trees* also supports *Lotus Notes*. Channel Computing also offers a maintenance program: For $125 a year, you get toll-free technical support, product updates, interfaces to new data formats as they become available, and discounts on major upgrades. The standard edition of *Forest & Trees*, which includes the new interfaces for *Q&A* and *Notes* along with *dBASE*, *Paradox*, *Btrieve*, and other file formats, lists for $495; the client-server edition, which adds the VAX interface as well as *SQL Server* and Oracle, lists for $1495. Network node packs cost $395. Channel Computing, 603/477-0444, 603/427-0385 (fax).

Reader service no. 638

Teleform-multiuser

WINDOWS *Teleform for Windows*, Cardiff Software's innovative program that converts check-box and hand-printed data from fax-modems into data base and spreadsheet files, now runs under Novell's NetWare. Like the stand-alone version, *Teleform-multiuser* lets you create forms that you fax to clients, remote sales offices, or whoever. Recipients fill in the requested information and fax the forms back to you; *Teleform* interprets the form (using handwriting and mark recognition) and then enters the data into the appropriate data file, including *1-2-3* and *dBASE* formats. With the new multiuser version, you can create *Teleform* fax forms at selected workstations, and send and receive your *Teleform* faxes via a dedicated fax

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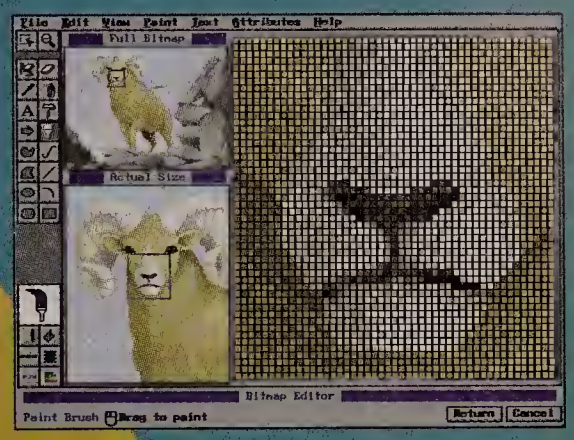

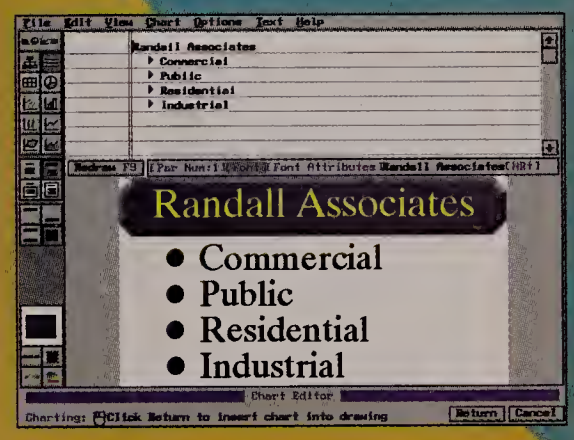

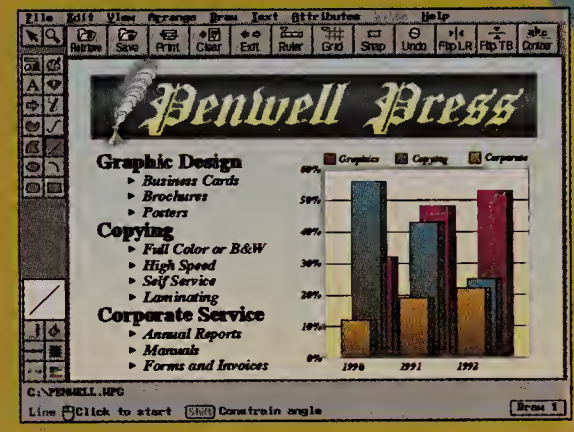

Test Drive WordPerfect® Presentations 2.0, the DOS Presentation Graphics Program That Does Charting, Drawing, and Painting . . . All in One!

WHAT'S ON THE TRIAL DISKS? You'll receive a working model of *WordPerfect Presentations 2.0,* the advanced DOS presentation graphics program that has the look and feel of a graphical shell without the hardware demands. If you're a DOS devotee, but envy the graphical look of *Windows* or Macintosh, this program gives you the best of both worlds. *WordPerfect Presentations* has a customizable button bar, supports copy and paste from its own clipboard, and lets you drag and drop objects and text with your mouse. Need to impress your clients with a slick slide show but don't have the time to jump through four presentation programs? *WordPerfect Presentations* makes it easy—and fast. Choose from 50 colorful master slides guaranteed to dazzle. Get your point across with a 3-D chart. When your clients arrive, give your slide show directly from your computer screen. Make sure they don't miss the bottom line—circle your best offer with *WordPerfect Presentations'* built-in highlighter. You can even incorporate music and voice to make your presentations come alive. With *WordPerfect Presentations,* you don't need to give up DOS for high-impact presentations.

HOW DO I GET MY DISKS? It's easy. Simply complete and mail the postage-paid reply card, or call WordPerfect toll-free at 1-800-526-5169 in the United States and Canada. Expect your disks to arrive in three to four weeks. For even faster results, sign up for PC World Online by calling 1-800-827-6364 ext. 5741, then download the working model for immediate access! Once connected, you're just a few steps away from making great presentations.

What are the system requirements?

- IBM PC AT, PS/2, or compatible with 512K of RAM
- Hard disk with 3MB free space
- DOS 3.1 or later
- EGA or VGA graphics adapter
- 5¼-inch 1.2MB high-density disk drive or 3½-inch 1.44MB high-density disk drive

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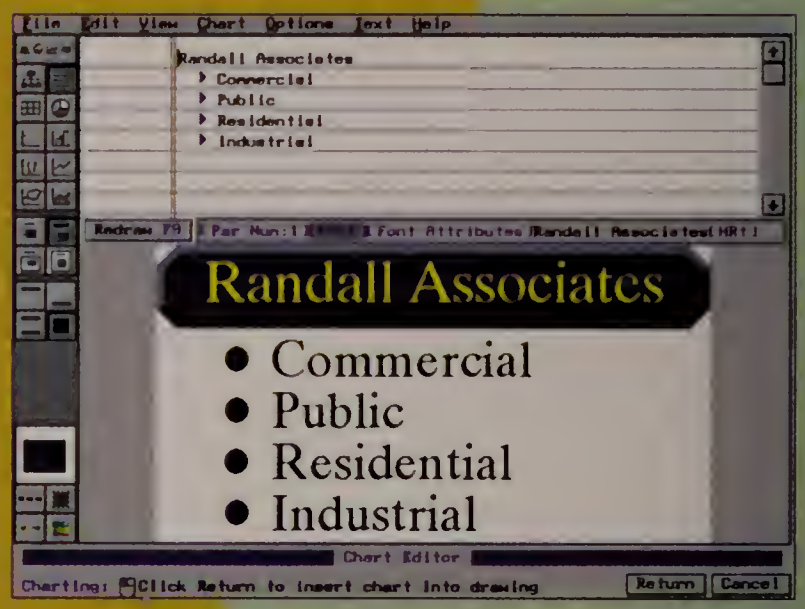

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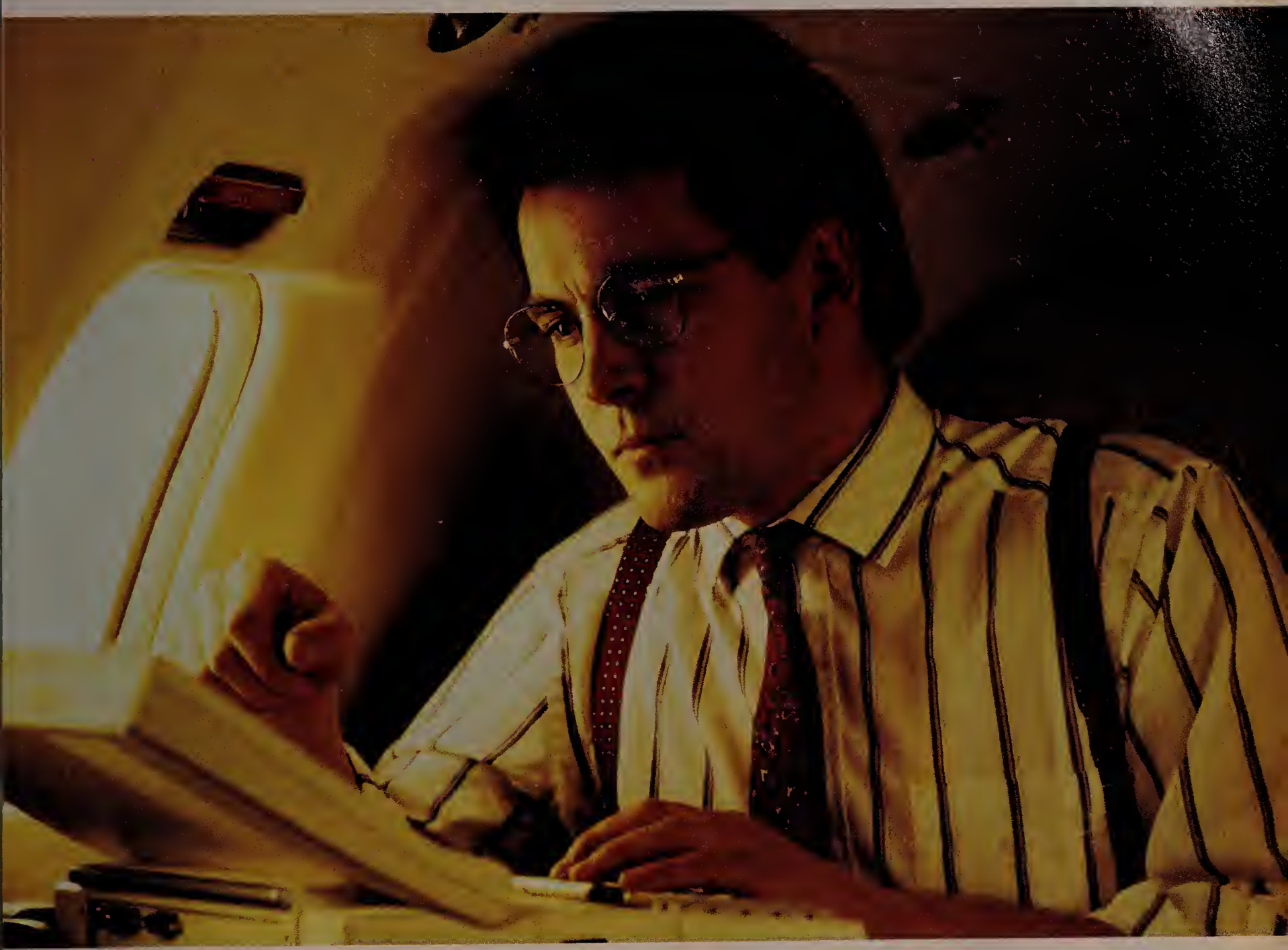

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FIND OUT IN THE DECEMBER ISSUE OF PC WORLD. Our editors have prepared a 20-page landmark report on the dawning of the era of mobile computing. In it, you'll learn just how far mobile computing has come – and where it will take you.

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Print Accelerator for Windows

WINDOWS If you own an IBM 4029 laser printer, you now can print up to ten times faster with no additional hardware. *Print Accelerator for Windows* is a new printer driver developed jointly by IBM and LaserMaster. Like the driver LaserMaster uses with its WinJet 300 printer accelerator card, *Print Accelerator for Windows* works in combination with the FastByte technology used in the 4029's parallel port interface. Instead of sending text and graphics to the printer, *Print Accelerator for Windows* uses the more powerful CPU of the host computer to bit-map the data, then compresses it and speeds it to the printer. The driver works with TrueType, PostScript, and Agfa Intellifonts. *Print Accelerator for Windows* now comes standard with every IBM 4029 laser printer, and the upgrade is free to previous buyers. Lexmark Int'l, 800/358-5835, 800/633-7662 Canada.

Reader service no. 640

Fastback Plus 3.1

DOS backup favorite *Fastback Plus* from Fifth Generation Systems has added sparkle in its *3.1* upgrade, which features support for QIC-80 tape and for Irwin 5580 and 3580 drives. Fifth Generation has also enhanced the installation process so you can preschedule unattended backups at initial setup. Long-time *Fastback* aficionados will appreciate the restoration of *Fastback Plus*'s command-line wild-card file selections, which can save you the step of setting up a backup group. Other improvements include a feature that lets you take a snapshot of your hard disk so that even if you make subsequent changes, you can later restore from a full backup just those files that were on the disk at the time of the snapshot. *Fastback Plus 3.1* lists for $189. Owners of prior versions can upgrade for $49. Fifth Generation Systems, 504/291-7221, 504/295-3268 (fax).

Reader service no. 643

Conner SofStor Series

Yesterday's 40MB hard disks no longer make the grade, thanks to huge graphical applications and their files. Conner, which made its reputation in the OEM market, is introducing its SofStor Series, a value-added hard disk line designed to make the migration to *Windows* a snap. The initial offerings are 3½-inch 17ms 85MB and 170MB Winchester IDE drives, which come preinstalled with MS-DOS 5.0, *Windows 3.1*, and *Microsoft Works for Windows*. In addition, each drive comes with *Central Point Anti-Virus*, demo versions of *Microsoft Money* and *Publisher*, an installation package, and abbreviated documentation for all the software. The 85MB Model 385A lists for $599, and the 170MB Model 3170A costs $699. Conner Peripherals, 408/456-4500, 408/456-4501 (fax).

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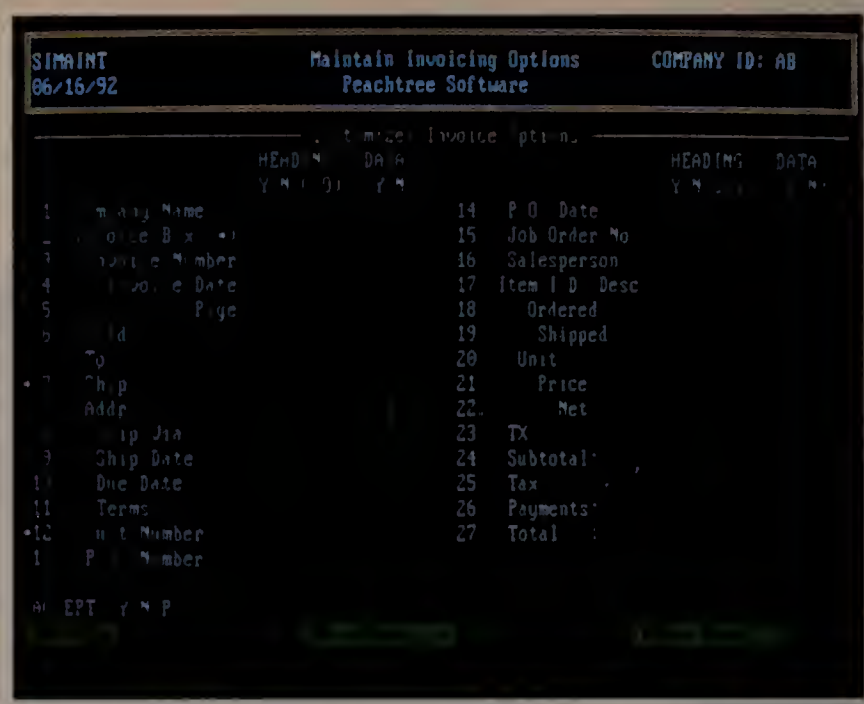

With Peachtree Complete Accounting, save hard disk space by installing only the modules you need. Version 6.0 includes customizable invoices, expanded lookup features, and more.

ing information, and phone books, as well as schedules and to-do lists. In addition to providing different "views" on the common data base, version 2.5 adds user-definable screens and fields, so work group members can customize their own views to suit their needs.

GoldMine's group scheduling capability lets those with the proper clearance view the schedules and to-do lists of others, find the status of tasks completed, and add other tasks if need be. Or you can type in the names of employees who need to attend a meeting, and *GoldMine* will get back to you with the times when all parties and conference rooms are available. *GoldMine* has a built-in spreadsheet that also tracks sales, making sales forecasting and analysis easy.

A five-user network pack is $895; the single-user version is $295. Upgrades are $149 for the network pack, $79 for a single user, and $99 for those switching from any other contact manager. Elan Software Corp., 800/654-3526, 818/999-9872, 818/999-9903 (fax).

Reader service no. 644

Peachtree Complete Accounting 6.0

Want integrated accounting without having to install every last module? With version 6.0 of *Peachtree Complete Accounting* and *Peachtree Basic Accounting*, you can now select which modules to install; only those functions will appear as menu choices. Other new features include a service invoice format, expanded lookup features, revamped documentation, and the ability to obtain working trial balances, customize invoices, and process handwritten checks. *Peachtree Complete* retails for $249 ($399 for the multiuser version); *Peachtree Basic*, which includes only general ledger, accounts receivable, accounts payable, invoicing, and inventory features, sells for $99. Upgrade prices vary depending on the version. Peachtree Software, 800/247-3224, 404/564-5888 (fax).

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For more information about any product, contact the manufacturer or circle the number on the reader service card.

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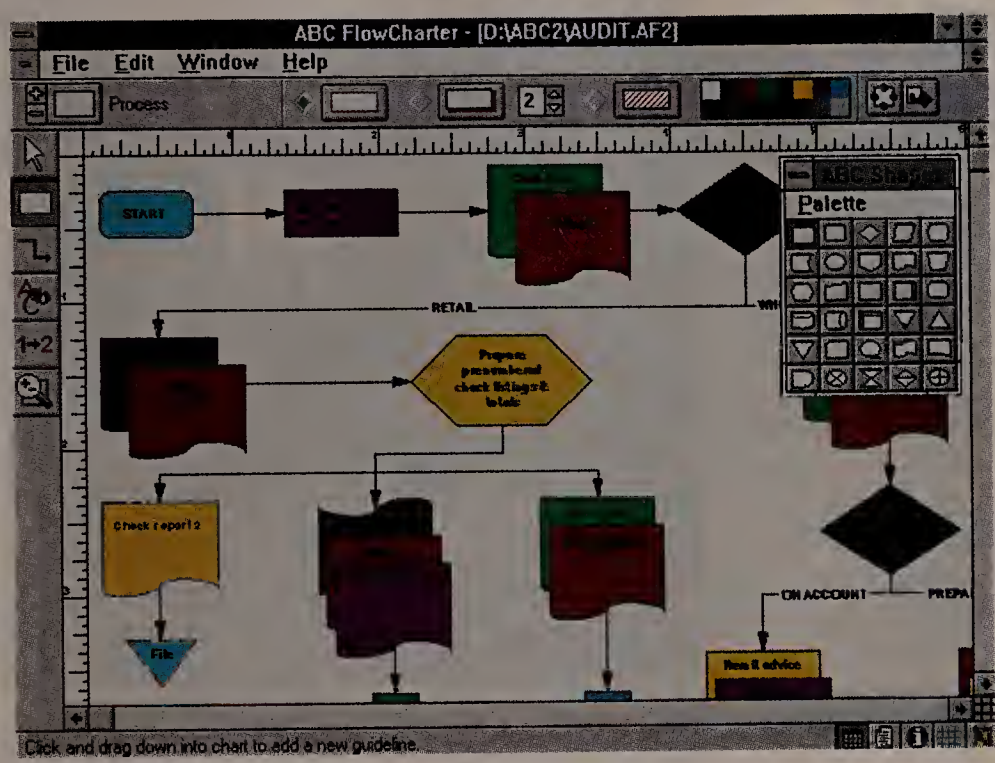

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> April 20, 1990
>
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> *DBMS Magazine*
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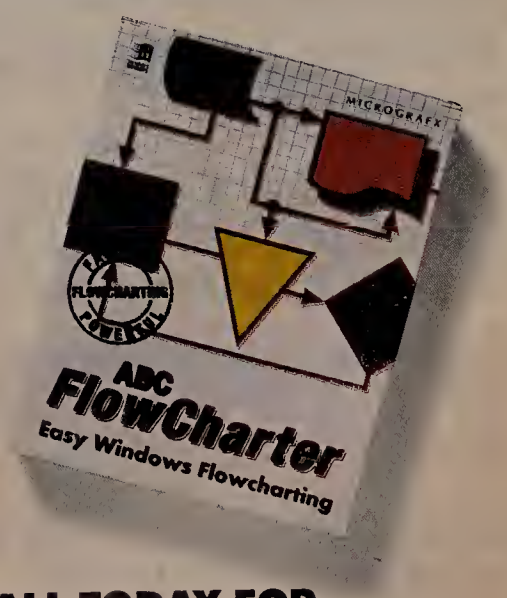

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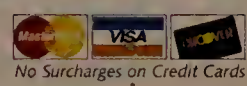

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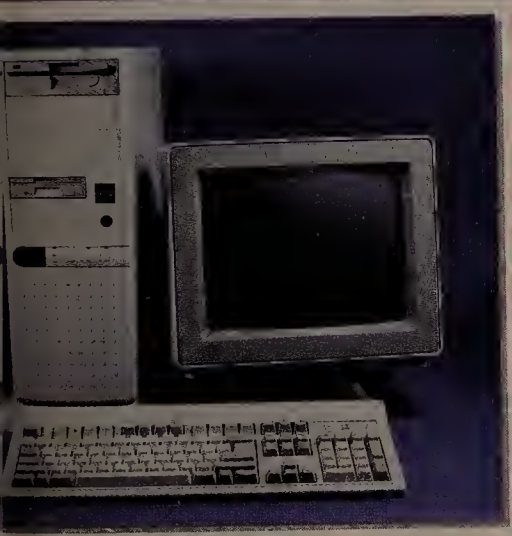

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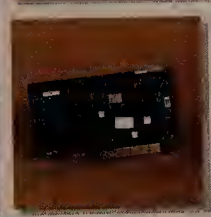

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Marketplace

Price Information To Make a Smart Buy

Over the Counter

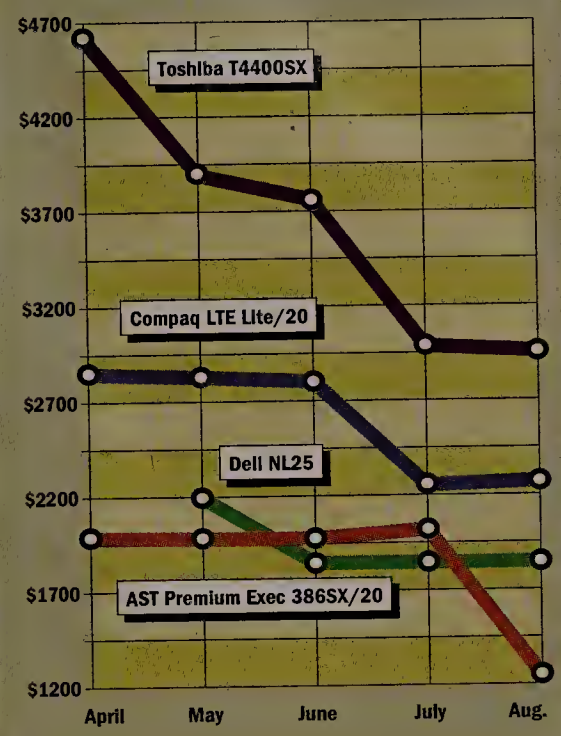
What you pay at retail stores for popular PCs

	Configuration			National	
	CPU/speed (MHz)	RAM (MB)	Hard disk (MB)	List	Average
386SX/SLC-based desktop PCs					
AST Power Premium 3/25s	i386SX/25	2	80	$1845	$1544
Compaq Prolinea 3/25zs	i386SX/25	2	84	$999	$935
DEC DECpc 333sx LP	Am386SX/33	2	52	$899	$899
Dell System 325 SX	i386SX/25	2	52	$820	$820
Gateway 2000 25MHz 386SX	i386SX/25	4	80	$1145	$1145
IBM PS/2 Model 56 SLC	386SLC/20	4	80	$2485	$1939
IBM PS/2 Model 57 SLC	386SLC/20	4	80	$2795	$2206
NEC PowerMate SX/25i	i386SX/25	2	60	$1549	$1279
386DX-based desktop PCs					
AST Power Premium 3/33	i386DX/33	4	210	$3095	$2634
Compaq Deskpro 3/33I	i386DX/33	4	120	$1979	$1819
Compaq Deskpro 386/33M	i386DX/33	4	120	$2569	$2381
Dell System 333P	i386DX/33	4	230	$1600	$1600
Hyundai CS-386/40	Am386DX/40	4	120	$1730	$1730
NEC PowerMate 386/33i	i386DX/33	4	120	$2049	$1691
Northgate 386/40	Am386DX/40	4	100	$1799	$1799
486SX-based desktop PCs					
AST Power Premium 4/25s	i486SX/25	4	210	$2995	$2484
Compaq Deskpro 486s/25M	I486SX/25	4	120	$2569	$2269
DEC DECpc 425sx LP	i486SX/25	4	245	$1849	$1849
Dell System 486D/25	i486SX/25	4	200	$2020	$2020
Gateway 2000 25-MHz 486SX	i486SX/25	4	200	$1670	$1670
486DX-based desktop PCs					
ALR BusinessVEISA	I486DX2/50	5	340	$5895	$4983
AST Power Premium 486/33	i486DX/33	4	210	$3495	$2947
Compaq Deskpro 486/33M	i486DX/33	4	340	$3869	$3475
Compaq Deskpro 50M	i486DX2/50	8	340	$4469	$3958
Dell 486D/66	i486DX2/66	8	230	$2850	$2850
Gateway 2000 50-MHz 486DX2 EISA	i486DX2/50	8	340	$3320	$3320
IBM PS/2 Model 90 XP-OKF	i486DX/33	8	400	$6915	$5563
IBM PS/2 Model 90 XP-OLF	i486DX2/50	8	400	$7415	$6024
NEC PowerMate 486/50e	I486DX/50	8	535	$5699	$4666
Portable PCs					
AST Premium Exec 386SX/20	i386SX/20	2	40MB	$1395	$1250
AST Premium Exec 386SX/25	Am386SXL/25	4	80MB	$1895	$1770
Compaq LTE Lite/20	i386SL/20	2	60MB	$2499	$2274
Compaq Portable 486c	i486DX/33	4	120MB	$8699	$7757
Dell Dimension NL25	i386SL/25	2	80MB	$1849	$1849
Gateway 2000 Nomad 420SXL	i486SX/20	4	80MB	$2695	$2695
Hyundai Super-NB386S	i386SX/20	2	60MB	$1349	$1349
IBM PS/2 Model N51 SLC	386SLC/16	2	80MB	$2265	$1843
NEC UltraLite SL/20	i386SL/20	2	80MB	$2199	$1799
TI Travelmate 3000WinSX	i386SX/20	4	60MB	$2599	$2208
Toshiba T3300SL	i386SL/25	2	80MB	$2899	$2543
Toshiba T4400SX	I486SX/25	2	80MB	$3399	$2960
ZDS Z-Note 325Lc	i386SL/25	4	120MB	$4791	$4791

From a national survey of more than 180 dealers by International Data Corporation. Figures are based on at least four price quotes for each machine. Prices are based on manufacturer's standard configuration without monitor.

Trend Line: Notebook Costs Drop

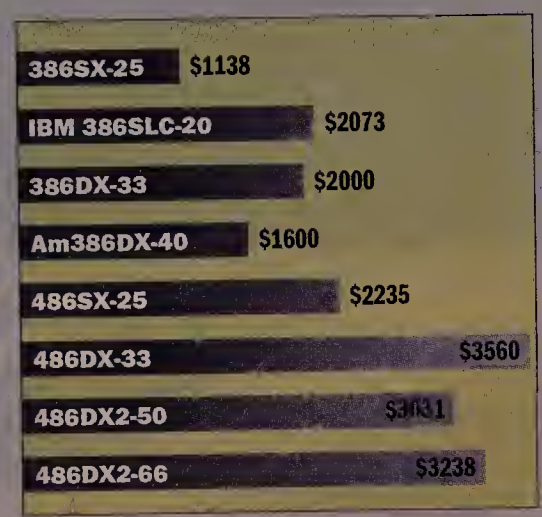
Average street price



Prices on notebook PCs slid dramatically this year. The cuts were deepest on older machines such as the AST Premium Exec and on higher-end models such as Toshiba's 486SX-based T4400SX. On both of those models, the price you pay has been slashed by more than a third since April. Further price adjustments are expected by year-end.

The Shrinking PC Price Spectrum

Average street pricing based on Over the Counter desktop model prices and IDC data



The CPU now plays a relatively small role in total PC system costs, which are driven more by the size of the hard disk, expandability, and other factors. For example, the fastest machine in the Over the Counter survey, Dell's 486D/66, is also the cheapest 486DX system in the survey. But average 486DX2-66 prices should come up, says IDC's Brian Clarke, as non-direct-mail vendors bring their systems to market.

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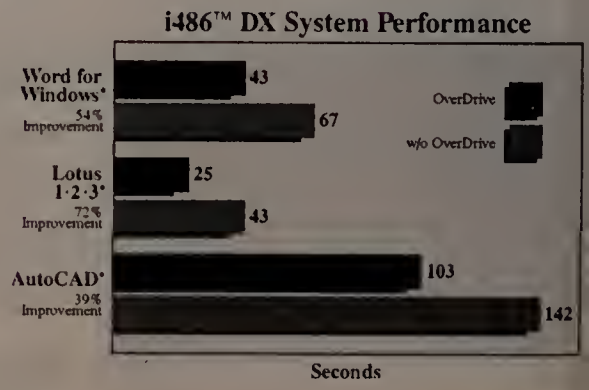

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†In cases where there is no OverDrive socket, Intel recommends installation by a qualified technician.

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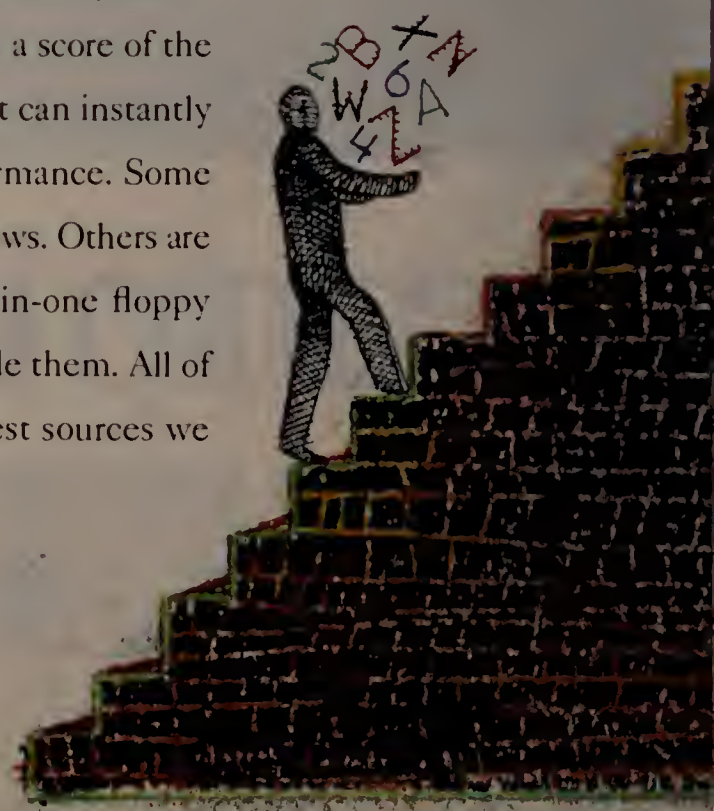
20 Top Upgrades

Edited by Anita Amirrezvani and Dan Miller

We're realistic. While *PC World* spends a lot of time talking about the latest and greatest systems, we know you can't buy a new computer every time a new processor or technical novelty turns up.

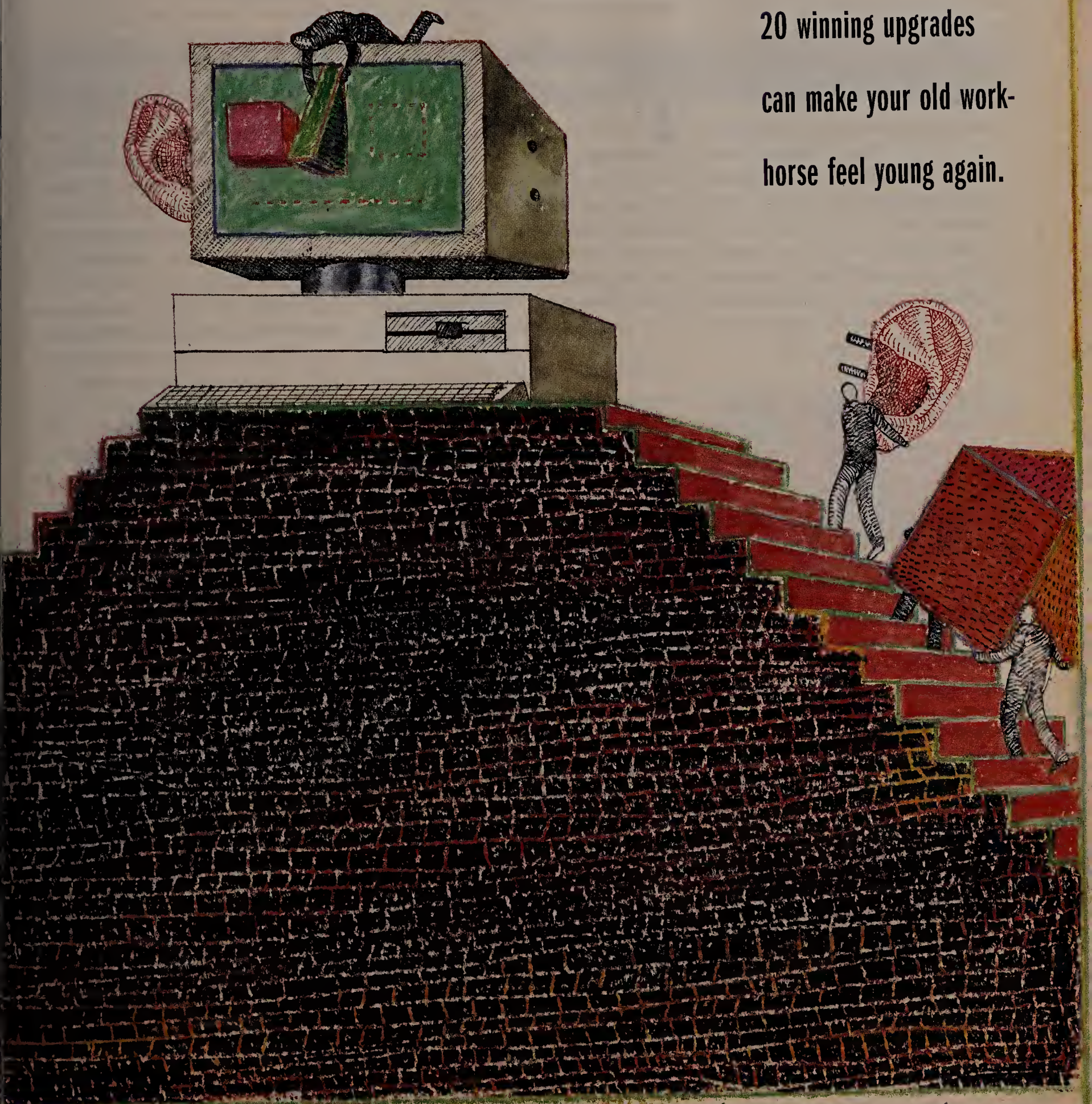
So chances are your system has lost some of its youthful high spirits, and what once seemed blazingly fast now feels a little poky. What to do? In a word, upgrade.

In the following pages, we've collected a score of the best upgrade ideas around, products that can instantly and easily improve your system's performance. Some are recent Best Buys from *PC World* reviews. Others are so compellingly sensible (like the two-in-one floppy drive from TEAC), we just had to include them. All of them are recommendations from the best sources we know: our contributing and staff editors.



COVER STORY UPGRADES

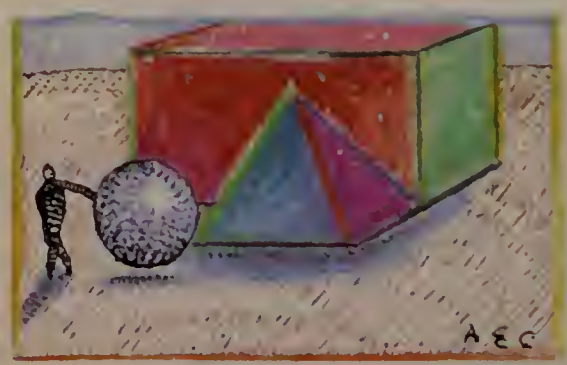
Has your PC seen better days? Chosen by our resident experts, these 20 winning upgrades can make your old workhorse feel young again.



Looking for faster graphics? Eric Knorr suggests the amazingly inexpensive Aamazing VGA700 board. You want sound? Check out Robert Lauriston's account of the Pro AudioSpectrum 16 board. Need more storage? We've got all kinds of ideas, from a caching disk controller to Iomega's Bernoulli drive. For faster printing, Daniel Tynan recommends an accelerated PostScript cartridge for HP LaserJets, and Steve Fox touts *SuperPrint*, a super print manager. We have a programmable keyboard, an uninterruptible power supply, *QEMM*'s memory manager, a scanner, a modem, and more—all kinds of little things that can make a big difference in your productivity.

Of course, not every upgrade path is smooth. To find out about some of the traps that could await you, see Michael Goodwin's sidebar about his experiences trying to install a soundboard and a CD ROM drive at the same time.

Despite the potential pitfalls, however, we hope these suggestions give you some ideas of what's possible. With a screwdriver and a little pluck, you could give that old desktop a whole new lease on life.



Graphics

Aamazing VGA700

Graphics accelerator

A graphics accelerator card for less than $100? It's true: Aamazing Technologies offers its VGA700 with 512K of RAM for $99 list, about $80 on the street. Our tests show this little board delivers more than twice the *Windows* performance of a standard VGA card, providing flicker-free images at resolutions up to 1024 by 768 in 16 colors—and you don't even need to set switches or jumpers to install it. Just stick it into a free expansion slot and copy over the relevant software drivers.

For those who want better performance and more colors (up to 64,000 at 800 by 600), Aamazing will be shipping its $179 VGA1000 by the time you read this. Both boards will boost popular DOS applications, including *1-2-3*, *WordPerfect*, and *AutoCAD*. As with any graphics accelerator, remember that unless you have a 17-inch monitor, stick with 800 by 600 resolution if you want screen fonts big enough to read without squinting. That's still an extra 57 percent effective screen space, enough to give you a much better look at applications. Not bad for $99. —*Eric Knorr*

Aamazing Technologies, 714/255-1688, 714/255-1686 (fax). List price: $99

Reader service no. 650

Ares Software FontMonger

Font conversion utility

Anyone who has switched to *Windows 3.1* and its built-in TrueType font software has faced the problem of converting pre-TrueType fonts to the new format. There are several utilities on the market that will help. What sets Ares' *FontMonger* apart is that it not only will convert virtually any font format to TrueType, but it will go the other font conversion packages one better by letting you customize your typefaces.

If you don't know where your existing font files are, *FontMonger* automatically searches disks or directories and displays all the files it can convert—including PostScript Type 1 and Type 3, Nimbus Q, Agfa and HP Intellifont, TrueType, LaserMaster, and *CorelDraw*. You can even convert fonts to and from Macintosh and NeXT.

Using *FontMonger's* custom tools for enhancing and modifying fonts is the fun part. You can remap keyboard characters, assign special symbols (such as trademark characters) to unused keys, combine characters from different fonts, create small caps and fractions, as well as scale, move, slant, and rotate characters. You can even import a simple graphic, such as a logo you designed in *CorelDraw* or *Adobe Illustrator*, and add it as a new character on the keyboard.

And that's not all: If you want to roll up your sleeves and edit a character's outline or create an entirely new character, *FontMonger* provides a separate window with built-in character drawing tools. *FontMonger* may offer more than the average user needs, but its reasonable $150 price makes it a great upgrade for any *Windows* user who is serious about fonts. —*Richard Jantz*

Ares Software Corp., 415/578-9090, 415/378-8999 (fax). List price: $150

Reader service no. 651

Sound

ATI VGAStereo-F/X

Sound and graphics board

I *had* to upgrade. My old video card was on its last legs—every other boot, my screen came up blank. Besides, my mouse was getting ratty, and I wanted to add sound.

Then I heard about ATI's VGAStereo-F/X. For $299 list, it gives me everything I want—8-bit sound and super-VGA display capabilities—on one add-in card. The 1MB version promises 1024 by 768 resolution with 256 colors and a flicker-free 72-Hz refresh rate. Also, it comes with a Microsoft-compatible 400-dpi three-button mouse and a built-in port. The only thing missing is a SCSI interface to connect a CD player—a feature likely to be included in a future release.

Upgrading is rarely fun—it usually means a day filled with arguing interrupts and fighting COM ports. But getting the VGAStereo-F/X into my system was surprisingly easy. It took less than 15 minutes to install the board in the expansion slot and attach the set of inexpensive speakers to the MIDI connection box (both included in the package). Although there's only one audio-in and one audio-out jack, the board's 8-watt amplifier lets you connect unamplified speakers or a set of headphones. You get a complete set of audio drivers to use in *Windows* that installs easily via the Control Panel. And you won't have trouble with applications requiring either Ad Lib or Sound Blaster, since the VGAStereo-F/X supports both of them. You also get a free copy of Voyetra Technologies's sound utilities to record, play, and edit sounds, along with 25 MIDI song files.

With the ATI VGAStereo-F/X, I was not only able to upgrade my graphics, I could also enter the brave new world of PC sound. —*Steve Bass*

ATI Technologies, 416/756-0718, 416/756-0720 (fax). List price: 512K $279, 1MB $299

Reader service no. 652

Media Vision Pro AudioSpectrum 16

Soundboard

Windows 3.1's new sound capabilities inspired me to buy the Pro AudioSpectrum 16 soundboard. This multifunction board handles voice recordings—the sound source business users are most likely to want—plus synthesized music, sound effects, and MIDI input and output for any *Windows* application that supports them. It also works with almost every noise-making DOS program on the market (in other words, games).

I chose the PAS16 because it sits about midpoint on the price-performance curve for soundboards. It costs more but sounds better (to my ears) than the Sound Blaster Pro. More expensive boards, such as the Turtle Beach MultiSound, cost twice as much but don't give you any advantage except better synth sounds, which I, for one, don't need. The PAS16 also has a SCSI port that's compatible with my Sony 541 CD ROM drive, and a hot key to mute any noises my PC is making (handy if I'm on the phone). It can also record and play back digital audio at the same specs used in audio CDs.

Installing the board was no problem—I just plugged it into one of the expansion slots, connected the speaker cord and two cables from the CD ROM drive, ran the Install utility, and rebooted. However, since the board uses a DMA channel, an I/O address, and two IRQs, some people may run into hardware conflicts during installation. (Unfortunately, when I did have questions, Media Vision's support staffers took a couple of days to return my calls.)

The Uphill Upgrade: Do-It-Yourself Multimedia

Several months ago I convinced myself that I'd be hopelessly out of date without a soundboard and a CD ROM drive for my home PC. Multimedia, here I come! So I bought a state-of-the-art soundboard, Media Vision's Pro AudioSpectrum 16. And since I was paying for all this myself and the soundboard wasn't cheap, I saved a few bucks by picking up a used Toshiba XM-3200B CD ROM drive.

Installing the hardware was easy enough. Once I got the board snugged into place and ran a power lead to the drive, I connected a SCSI cable from the drive to the board's built-in port and hooked up a cheap set of Walkman-style speakers to the soundboard.

Then I made a big mistake: I put the PC's case back on and tightened the screws. One essential corollary to Murphy's Law says, *Never* tighten the screws.

Both the drive and the soundboard came with drivers; in fact, the CD ROM drive came with *two* drivers, one for CONFIG.SYS and one for AUTOEXEC.BAT. I loaded the drivers, booted up my system—and got that awful sinking feeling when I read the resulting error message: 'No drive found'.

Several hours later, after I had tried every conceivable switch, interrupt option, and cable position, I gave up. The soundboard worked fine; music and sound effects generated by applications played through its speakers and sounded great. But the CD ROM drive was maddeningly nonfunctional.

Deciphering SCSI Logic

It took a bunch of calls to learn that even though the SCSI interface is standard, CD ROM drivers need to match both the drive *and* the soundboard. Finally, after I told Media Vision which drive I was using, it sent me a multimedia upgrade kit containing new AUTOEXEC.BAT and CONFIG.SYS drivers and two cables: a SCSI cable and a CD audio cable with a three-pin connector on one end to match the drive. (Different CD drives have different audio pin-outs.)

I installed the new software and rebooted my system—bracing myself for another error message. This time everything worked. I replaced the case, tightened the screws, and sat back, feeling pleased with myself.

It took several hours before I noticed I couldn't print. I began feeling sick again. Out came the screws, off came the case. After some tinkering, I finally figured out that the soundboard was hogging interrupt 7, which services the parallel port. Once I reconfigured my print caching software, I was back in business.

Next step: *Windows*. I had installed the multimedia extensions when I upgraded to *Windows 3.1*, so I figured getting my new hardware up and running would be a piece of cake. Wrong. The first problem was that *Windows* couldn't find either the soundboard or the CD drive. Grrr! Eventually I deduced that you need to load all three drivers from DOS *before* you load *Windows*. Not one of the three pertinent manuals saw fit to mention this fact!

To CD or Not to CD

Finally, with the help of *Windows'* multimedia extensions, it was time to fire up the full power of my new hardware. I wanted to be able to play audio CDs through the soundboard so I could record digital samples and add them to my business presentations. The hard part was getting the drive to spin the audio disks.

***Mplayer*, one of *Windows'* multimedia utilities, is designed specifically for this purpose. But when I pulled down the device menu in *Mplayer*, the CD drive was missing. The manual suggested that I use Control Panel to install the CD audio driver. After a number of false starts, *Windows* gave me the message I was waiting for: 'CD audio driver successfully installed'. Unfortunately, the CD player was *still* missing from *Mplayer's* device menu. After all of the previous hassles, this latest annoyance failed to surprise me. I was becoming battle-hardened.**

In desperation, I called *Help Line* editor Robert Lauriston. He made a house call, hacked his way into several of my INI files, and discovered that my initial attempts to install the driver had created duplicate entries. After we deleted all but one and rebooted, *Mplayer* discovered that it knew about my CD drive after all—and was now quite cooperative about spinning up audio CDs.

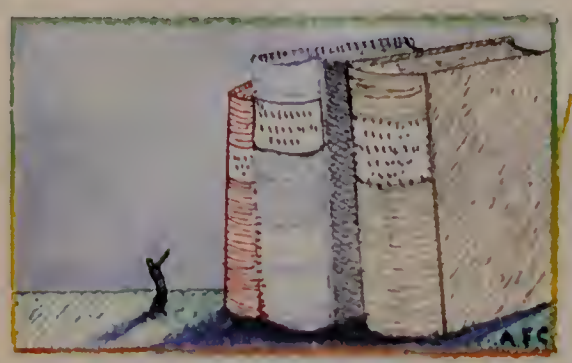
So I may be late, but now I'm up to date—at least in the multimedia department. But after all the upgrade agony, I can't help wondering if multimedia is really ready for prime time. I'm fairly confident poking around under the hood of my PC; if you're not, you might do a *lot* better looking into a turnkey multimedia system like ALR's PowerFlex Flyer 3SX/25 MPC. Sure, you'll have to spend a lot more than the $600 *I* dropped—but you won't need to loosen a single screw.

—Michael Goodwin

If you put together a lot of business presentations, play a lot of computer games, are shopping for a CD ROM drive, or own a MIDI synthesizer, you'll definitely want a soundboard. For my money, the PAS16 is the best deal going. —*Robert Lauriston*

Media Vision, Inc., 800/348-7116, 510/770-8600. List price: $299, MIDI breakout box $69.95

Reader service no. 653



Storage

Alpha Research Series 400 S425I

Caching disk controller

Whenever I use *Windows* or a data base on my 386, I end up tapping my fingers impatiently during the seemingly endless disk reads. That is, I did until I installed Alpha Research's Series 400 caching disk controller.

A caching disk controller puts big chunks of data into a fast RAM cache, minimizing disk reads and freeing up the CPU to handle I/O transactions in between other jobs. The resulting speedup is impressive.

Price was a big consideration for me, so I selected Alpha Research's Series 400 controller, which sells for about $300 on the street with 4MB of RAM. Or you can buy the card without the RAM for about $225 on the street and install up to 16MB yourself using standard SIMMs bought at a discount store or by mail order.

Installation was a snap. I used my computer's setup program to disable the motherboard's IDE connector for the hard disk and floppy drives, seated the card in a convenient slot, and plugged the hard disk into its new home on the controller. The last step was to use the PC's setup program to change the hard disk type. Unlike some other controllers, the Alpha doesn't require you to reformat your hard disk.

When I rebooted my system, I was blown away by the increase in speed. Every disk activity, from saving a file to task switching under *Windows*, accelerated dramatically. Suddenly my 386 felt more like a 486. —*Rex Farrance*

Alpha Research, 512/836-0709, 512/836-0944 (fax). List price: $325 (not including cache)

Reader service no. 654

Colorado Memory Systems Jumbo 120

Tape drive

Last year when I replaced my cramped 40MB hard drive with a new 120MB model, I realized that backing up to disk was no longer practical, so I decided to buy a tape drive as well. I chose the Colorado Memory Systems Jumbo 120 for the company's great reputation (*PC World*'s readers gave it a World Class award last year) and because my dealer highly recommended it.

Installing the Jumbo was no big deal. I had to buy a three-drive ribbon cable for my floppy controller, and since my power supply had no free cables, I had to buy a power Y-splitter too. Then I just secured the Jumbo in its drive bay and plugged in the new cables. The drive worked fine the first time out and every time since.

The house-brand backup utility that comes with the Jumbo drive is flexible enough for most backup tasks. Its data compression is good enough to back up my whole hard drive to a single DC-2120 tape. However, if you don't know which backup set holds the file you want to restore, tracking it down takes forever. Accordingly, I use the much more powerful *Central Point Backup for Windows* instead. When I need to retrieve an old version of a file, I can just pick the one I want from a list of all available backup copies.

Recently I ran out of disk space yet again and added a second 120MB drive. Consequently, if I were shopping today I'd go for the Colorado Memory Systems Jumbo 250 instead so I could fit backups of both drives on a single tape. —*Robert Lauriston*

Colorado Memory Systems, Inc., 800/845-7905, 303/669-8000. List price: $249

Reader service no. 655

Iomega Bernoulli Transportable 90 Pro

Removable-media hard drive

I know hard disks don't *really* shrink from overuse, but mine always seems to. My 130MB Winchester seemed big when I got it last December—but that was before I installed *Windows 3.1*, *Excel 4.0*, *Norton Desktop for Windows*, *HiJaak*, and so on. I finally decided enough was enough and ordered an Iomega Bernoulli drive.

Although the $949 list price is high, for convenience the drive can't be beat. The Bernoulli drive uses removable media, so I can use it to store seldom-used applications and to archive data, leaving plenty of room on my hard disk for programs I use daily. If I run out of space, I just slide in a new 90MB cartridge—a quicker way to access data than fishing around on a backup tape. What's more, the removable cartridges are built to withstand rough treatment.

Iomega's step-by-step documentation makes for easy installation; you just slide in the drive, run the menu-driven software, and use Iomega's utilities to format the cartridge in about 15 seconds. (Note that you have to use DOS 4.*x* or 5.*x* or a version that supports partitions larger than 32MB.) I immediately moved more than 35MB of applications and data off my Winchester and basked in the luxurious feeling that my hard disk capacity was actually growing for a change. —*Rex Farrance*

Iomega Corp., 800/777-6179, 801/778-3450 (fax). List price: $949, internal version $799; three-pack of 90MB cartridges $687

Reader service no. 656

TEAC FD-505

Combination floppy drive

What do you do if your home PC has a 5¼-inch floppy drive and your system at work a 3½? Until now, you were limited to uploading and downloading files by modem, or by wheedling co-workers with two-drive systems into letting you copy your floppies.

Your uploading, downloading, and wheedling days could be a thing of the past, thanks to TEAC's FD-505 combination floppy drive. The FD-505 packs a 5¼- and a 3½-inch drive together in a single half-height unit—an idea so practical you wonder why nobody thought of it before. It makes sense for anybody with incompatible drives on two machines, or anyone who wants to free up a drive bay.

Installing the FD-505 is a snap. You just remove your old 5¼-inch drive, slide in the TEAC unit, and attach the drive and power cables. You then call up your CMOS setup utility and let it know you now have two floppy drives. Though you connect just one drive cable to the drive, you still address the two drives as drive A: and drive B:. I

completed the entire process of installation and setup in about 5 minutes.

The key to the FD-505's success is the thinness of the 3½-inch drive—it measures just half an inch. Another neat design trick: The eject mechanism of the 5¼-inch drive works like those of 3½-inchers; instead of swinging a lever up and down to eject the disk, you press a button.

With a street price under $200, the FD-505 will cost you a bit more than two floppy drives bought separately. But if you're short on storage bays or just tired of bugging your co-workers, this drive is a great upgrade. —*Dan Miller*

TEAC America, Inc., 213/726-0303 ext. 819, 213/727-7652 (fax). List price: $249

Reader service no. 657

Toshiba TXM-3301E

CD ROM drive

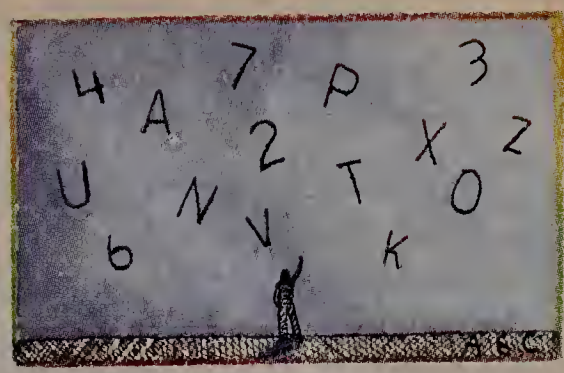
Despite all the hoopla surrounding multimedia, I decided I wanted a CD ROM drive—not to play fantastic multimedia games but to access large data bases of information. I've always been an information junkie, and the idea of having a PC-based encyclopedia at my beck and call was irresistible.

The Toshiba TXM-3301E CD ROM offers high quality and speed and earned a Best Buy in *PC World*'s CD ROM drive review (May 1992). I had little trouble installing the drive; the only problem I encountered was a small software driver incompatibility.

After setting up the drive and its software, I immediately set about quenching my thirst for knowledge with inexpensive CD ROM titles such as the *World Fact Book* from Bureau Development and the *Software Toolworks World Atlas*. But even if you really want a drive for multimedia applications, you can't do much better than the Toshiba. It performed well in *PC World* speed trials, and its performance with full-motion video is nothing short of excellent. —*Owen Linderholm*

Toshiba America Information Systems, Inc., 714/583-3000, 714/583-3133 (fax). List price: $950 (with Future Domain controller)

Reader service no. 658



Printing

Pacific Data Products PacificPage PE/XL 5.1

PostScript cartridge/accelerator board

It's no secret that the cheapest way to add PostScript fonts and graphics to your HP LaserJet is by installing a PostScript cartridge. Unfortunately, you can grow old waiting for your printouts—cartridge solutions are notoriously slow.

That's why I like PDP's PacificPage PE/XL. The $999 PE/XL combines a PostScript cartridge with a RISC-based accelerator board, turning your HP into a graphics-spewing beast for about half the cost of a low-end PostScript machine.

Besides speed, the best thing about the

Processor Upgrades: Putting Your System Into OverDrive

Until recently, upgrading your system's processor was a bit like replacing your car's engine—a daunting project best left to the pros. But with the advent of upgrade-ready motherboards and upgrade-specific processor chips, owners of 486 and even 386 systems can easily soup up their desktop machines.

486s: Born to Be Upgraded

For 486SXs, the key to easy upgrades is Intel's OverDrive chip. Most 486SXs come with the Intel upgrade socket, which accepts the 169-pin OverDrive. If your motherboard lacks that socket, a second version of the OverDrive fits in the socket of the original CPU.

No matter where you install the OverDrive, it should boost performance immediately. Like the 487SX, the OverDrive usurps all processing from the original processor, but it goes the 487SX one better by running twice as fast internally as the system clock. The OverDrive also has a built-in math coprocessor (FPU).

The result: Intel originally claimed these chips would improve overall application speed by up to 70 percent, and *PC World* application benchmarks of OverDriven 486SX-20s found that real-life improvements ranged from 26 percent (on word processing) to 250 percent (on our CPU- and FPU-intensive *1-2-3* test)—about 70 percent overall.

What about owners of 486DXs? There's an OverDrive chip for most of them too. At press time, Intel planned to announce 25- and 33-MHz OverDrives for DX systems. Two versions will be available—one will fit in the 169-pin OverDrive socket that some system vendors have started including on DX motherboards, the other will fit in older systems, replacing the 168-pin 486DX. One warning: an OverDrive upgrade may not work if your system has no memory cache, if its BIOS is more than a year old, or if the case isn't adequately ventilated. Also, because the 486DX already has a built-in math coprocessor, you won't get the same dramatic improvements in speed on FPU-intensive apps as you do in a 486SX.

If you have a system based on the 486DX2-50, check your manual to see if the system clock can be switched from 25 to 33 MHz. If it can, you may replace the original processor with a faster DX2-66. Another option may be available in 1993, when Intel expects to release its P5-based OverDrive chip for DX2s.

Cyrix 486DLC: Hope for 386s?

Finally, for owners of 386DXs who want to graduate to 486-level computing without radical system surgery, help may be on the way from one of Intel's competitors. Cyrix's 486DLC, a 486-compatible processor with a 386DX pin-out, has already been introduced as the original processor in several systems. Apparently, however, some users have taken to buying the chip separately and plopping it into their 386 system boards.

At press time, Cyrix is beta testing an end-user upgrade package that would include the DLC chip and software for updating the system BIOS. For systems that have surface mounted processors, Cyrix may also include a piggyback socket that would fit over the original processor and connect the DLC to the original chip's pins.

—TJ Byers

PE/XL is its easy installation. If you can follow directions (the user manual is extremely friendly) and know which end of a screwdriver is which, you can install the PE/XL. Just pop the HP's access panel, unscrew the metal cover guarding the I/O interface, and slide the board into a RAM expansion slot. Replace the plate and panel, reconnect your cables, and slap the PacificPage cartridge into the font slot. All that's left is to install screen fonts and PostScript drivers, and to reset some of the printer's parameters via the *Windows* Control Panel (or a DOS MODE command). Take my word for it: I'm no technical wizard, and it took me a grand total of 12 minutes to install the PacificPage PE/XL.

Once you install the board and cartridge, you'll find that simple text files print a smidge swifter with the PE/XL, but the real benefits come with graphics. Complex PostScript images crank out two to three times faster, so if you're the type who reprints revision after revision of your newsletter or presentation until it comes out right, the PE/XL will spare you hours of frustration.

My only caveat: The PE/XL works only with the LaserJet Series II and III families. At press time, Pacific Data was readying a version of the board that sniffs out each print job and automatically switches between PostScript and PCL, making it viable for network use. —*Daniel Tynan*

Pacific Data Products, 619/552-0880, 619/552-0889 (fax). List price: $999, accelerator board alone $599

Reader service no. 659

Zenographics SuperPrint

Print management software

I admit it. I'm a printer hog. Long documents, graphics, and fonts—especially fonts—I love 'em. Getting stuck behind me on the network print queue is like waiting in line at the post office behind the bozo with the 14 not-fully-labeled parcels.

To keep from alienating the entire office, I installed a copy of *SuperPrint 2.2* from Zenographics. It's a *Windows*-based print accelerator and font scaler that has substantially speeded up my network print jobs. And even more important to me (if not to my impatient co-workers), its print spooling utility, SuperQueue, returns my screen to me within seconds.

This magic is done with *SuperPrint*'s printer drivers, which are much faster than the default drivers that come with *Windows 3.1*. Load the appropriate driver for your printer (it supports everything from HP LaserJets to Epson-compatible dot matrices) and select Print from whatever application you're using. That's all there is to it.

Here at the *PC World* office, the jury is split over *SuperPrint*'s performance. Some of us swear by it, since it's tripled our output speed. A few people had some problems at first—the program seemed to substitute strange new fonts for time-honored favorites, <Alt>-<Tab> no longer worked as a toggle in *cc:Mail for DOS*—but tweaking some PIF files and reinstalling some fonts seemed to clear up these glitches.

My own experience has been substantially more positive, even though the default Times font in *Word for Windows* suddenly changed to Palermo until I reinstalled *Adobe Type Manager*. But I still swear by it: In an office environment, it's one of the best $149 investments you can make. And even if you don't get a copy for yourself, you and your colleagues can always chip in to buy one for the bozo with all the fonts. —*Steve Fox*

Zenographics, 800/366-7494, 714/851-1314 (fax). List price: $149

Reader service no. 660

Input Devices

Calera WordScan

Optical character recognition software

If you already have a scanner but use it only to scan images, you're missing out on one of the smartest upgrades available: optical character recognition (OCR) software. With Calera's $295 *WordScan* for *Windows*, you get a powerful OCR package capable of converting stacks of printed pages into text files formatted for your word processor of choice.

OCR chores are simple with *WordScan*'s snazzy icon-driven windows. You click icons for text or image scanning or both, page orientation, type quality, image source (scanner, disk file, or fax), and brightness. *WordScan*'s handy preview mode lets you click additional icons to define screen areas where you want to capture text, images, or numbers only. Best of all, each area you specify can be saved as a template and reused—handy for streamlining recurrent OCR tasks.

Of course, no character recognition software is perfect; 95 to 98 percent accuracy is the current standard, so you'll have to spend some time spell-checking converted files. Still, if you need to convert documents from paper to electronic form, I nominate *WordScan* as one of the smartest upgrades around. —*Richard Jantz*

Calera Recognition Systems, Inc., 800/544-7051, 408/720-0999. List price: $295

Reader service no. 661

Logitech ScanMan Model 256

Scanner

If you dream about adding a flatbed scanner to your desktop publishing and graphics arsenal but can't justify spending the bucks just for occasional scans, consider a hand scanner. Although not as good as desktop models for daily use, hand scanners are cheaper, easier to store, and better at scanning bound materials such as books.

I've found that Logitech's ScanMan Model 256 is a good choice if you primarily want to scan small images such as logos or drawings, for use in your desktop publishing, word processing, or illustration program. Because it supports 256 gray scales and selectable resolutions of 100 to 400 dpi, ScanMan is also fully capable of capturing high-quality photographs and other continuous-tone art.

Bundled with ScanMan is Logitech's *FotoTouch*, a proficient *Windows* image-editing application that includes both basic manipulation tools (for scaling, rotating, and flipping) and advanced features such as tone adjustment, image straightening, and image transformation (for smoothing, sharpening, and so on). Best of all, for large images that exceed ScanMan's maximum scan size (4.1 by 20 inches), you can use *FotoTouch*'s AutoStitch capability to merge as many as four separate scans painlessly into a single image. This superior AutoStitch capability places ScanMan ahead of most competing hand scanners.

And if that's not enough, if you're moving too fast to obtain straight and accurate scans, ScanMan flashes a light and sounds an audi-

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Circle 237 on reader service card

ble warning. How can you resist a hand scanner that talks back? —*Richard Jantz*

Logitech Inc., 800/552-8885 (CA), 800/231-7717, 510/795-8500. List price: $449

Reader service no. 662

Maxi Switch MaxiPro-II

Programmable keyboard

I spend a lot of time banging away on a keyboard and often find myself typing the same keystroke sequences. Over the years I've tried several schemes to reduce the number of keystrokes, including customized batch files and key-saving software like *AutoRun*. But the most productive tool I've found so far is the $125 MaxiPro-II programmable keyboard from Maxi Switch.

The MaxiPro-II's 2K of RAM lets you save up to 1800 keystrokes in a macro for instant replay. You can make one big macro or several small ones and assign each to any of almost 700 key combinations on the 124-key keyboard. You can even insert pauses that enable you to type in variable data such as a file name.

As a bonus, the MaxiPro-II lets you remap key locations, allowing you to trade, for example, the positions of <Caps Lock> and <Ctrl>. A long-life lithium battery powers the RAM so programming isn't lost when you turn off the PC.

Installation is as simple as unplugging your old keyboard and plugging in the MaxiPro-II. So if you find yourself doing more typing than you think is necessary, the MaxiPro-II is a fast, easy way to improve your productivity. —*TJ Byers*

MaxiPro-II Maxi Switch, 602/294-5450, 602/294-6890 (fax). List price: $125

Reader service no. 663

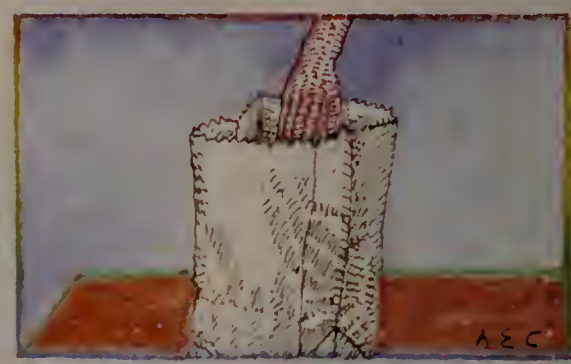
Microsoft BallPoint

Portable mouse

Got a laptop? Use *Windows?* Then you need Microsoft's BallPoint Mouse. This portable trackball gets my vote for the smoothest action: You wrap your hand around it in a natural position, using your thumb to spin the ball, and your first two fingers to work the buttons. Installing BallPoint is a snap, thanks to illustrated instructions and a handy bracket that clamps onto your keyboard. With my laptop, I had to remove the BallPoint to close the unit, but Microsoft has developed special clips for certain laptops that let you close up while leaving BallPoint in place. For portable mousing, the BallPoint's the way to go. —*Melissa R. Riofrio*

Microsoft Corp., 800/426-9400, 206/882-8080. List price: $175

Reader service no. 664



Miscellaneous

American Power Conversion Back-UPS

Uninterruptible power supply

Let's face it—you're a worrywart. You back up your hard disk religiously, run diagnostics when you should be playing with the kids, and have an ergonomically correct desk. You're prepared. You're ready.

And then one day lightning strikes a power transformer down the block, and your PC faints dead away, the hard disk

Memory: The Smartest Upgrade of All

Okay, so adding a new CD ROM drive isn't for everybody. But there's one upgrade that makes sense for virtually every PC user, and that's adding more memory.

Installing more RAM will improve your system's performance more than almost anything else short of buying a new processor. In a recent *PC World* study ("Stretching Your Upgrade Dollar," September 1992), we found that going from 2MB of RAM to 4MB improved *Windows* performance more than 100 percent. DOS apps, such as *1-2-3* and *dBASE*, also posted gains.

What's even more impressive is the price: Right now, moving from 2MB to 4MB will cost you less than $100 and as little as $65 (see table).

But before you run to your nearest superstore, you need to find out a few things (check your manual or call technical support): First, does your system use standard SIMMs? If not, you'll probably have to shell out whatever your vendor demands for a proprietary memory module.

Second, what kind of SIMMs do you need? Memory modules come in a variety of densities (256K, 1MB, and 4MB are the most common) and speeds (usually 80ns, 70ns, or 60ns). If your new SIMMs are slower than the originals, your machine won't boot. Most PCs use 9-bit memory chips; when you see ads for "1MB x 9 70ns" SIMMs, the "x 9" identifies them as 9-bit chips.

To install your new RAM, just take off the cover and find the banks of SIMMs (check that manual). Some badly designed systems hide the memory banks underneath hard drives or expansion cards, so you may have to remove these before proceeding. Once you find the banks, it's a simple matter to pop the SIMMs in place.

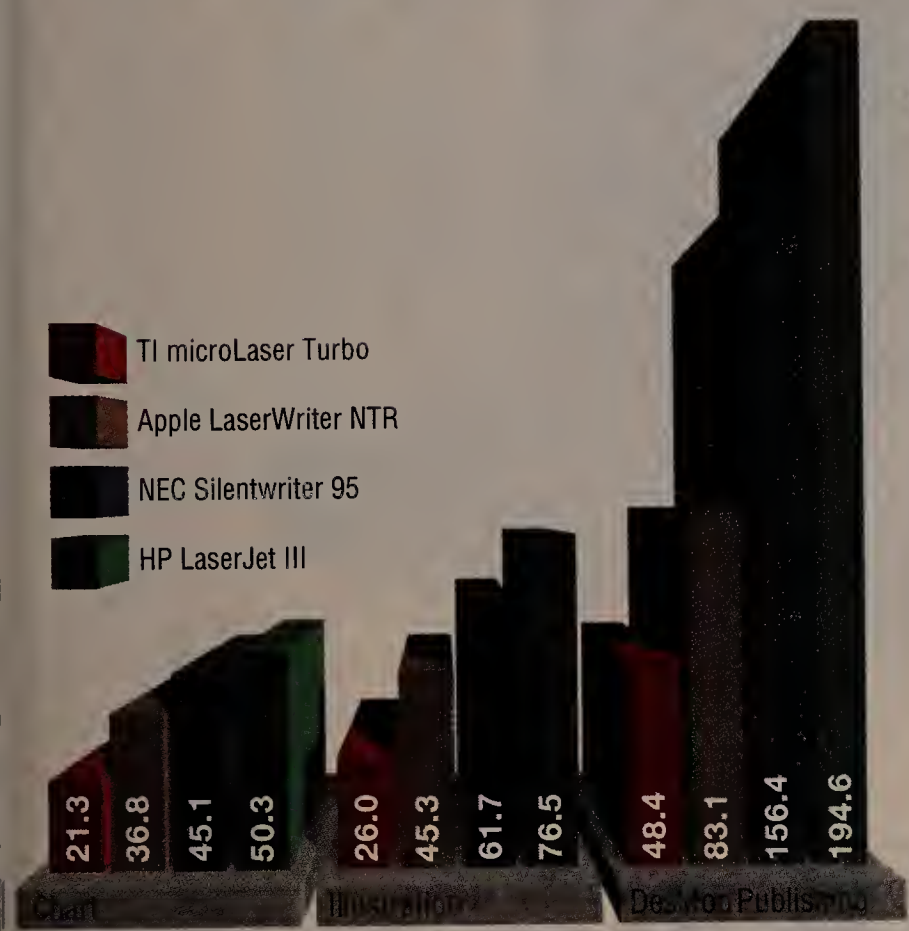
Once the SIMMs are installed, you'll have to run your system's setup utility to tell your PC about the new memory. You may also want to tune your system's memory manager and adjust the size of caches, RAM disks, and other memory utilities. Then sit back and watch your system fly. —Dan Miller

Average SIMM Prices

	Mail order	Local electronics chain	National superstore chain
256K 80ns	$13.20	–	–
256K 70ns	$15	–	–
256K 60ns	$15.24	–	–
1MB 80ns	$37	$32.99	$49.99
1MB 70ns	$38	$39.99	$49.99
1MB 60ns	$39.04	$39.99	$49.99
4MB 80ns	$131	$109.99	$117
4MB 70ns	$145.36	$116.99	$159
4MB 60ns	$154.38	$129.99	$179

FASTER FASTER FASTER

LOWER



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Best of all, with its new lower price of $1,749** for the PC model and only $50 more for PC *and* Mac compatibility, the microLaser Turbo is selling fast, too. Call right now for more information on the Turbo or other microLaser printer models. **1-800-527-3500.**

TEXAS INSTRUMENTS

MACWORLD MW EDITORS CHOICE

MacUser

*Call TI for a copy of Genoa Technology's benchmark test results and specifications of models tested.
**Manufacturer's suggested retail price — dealer prices may vary.
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76532

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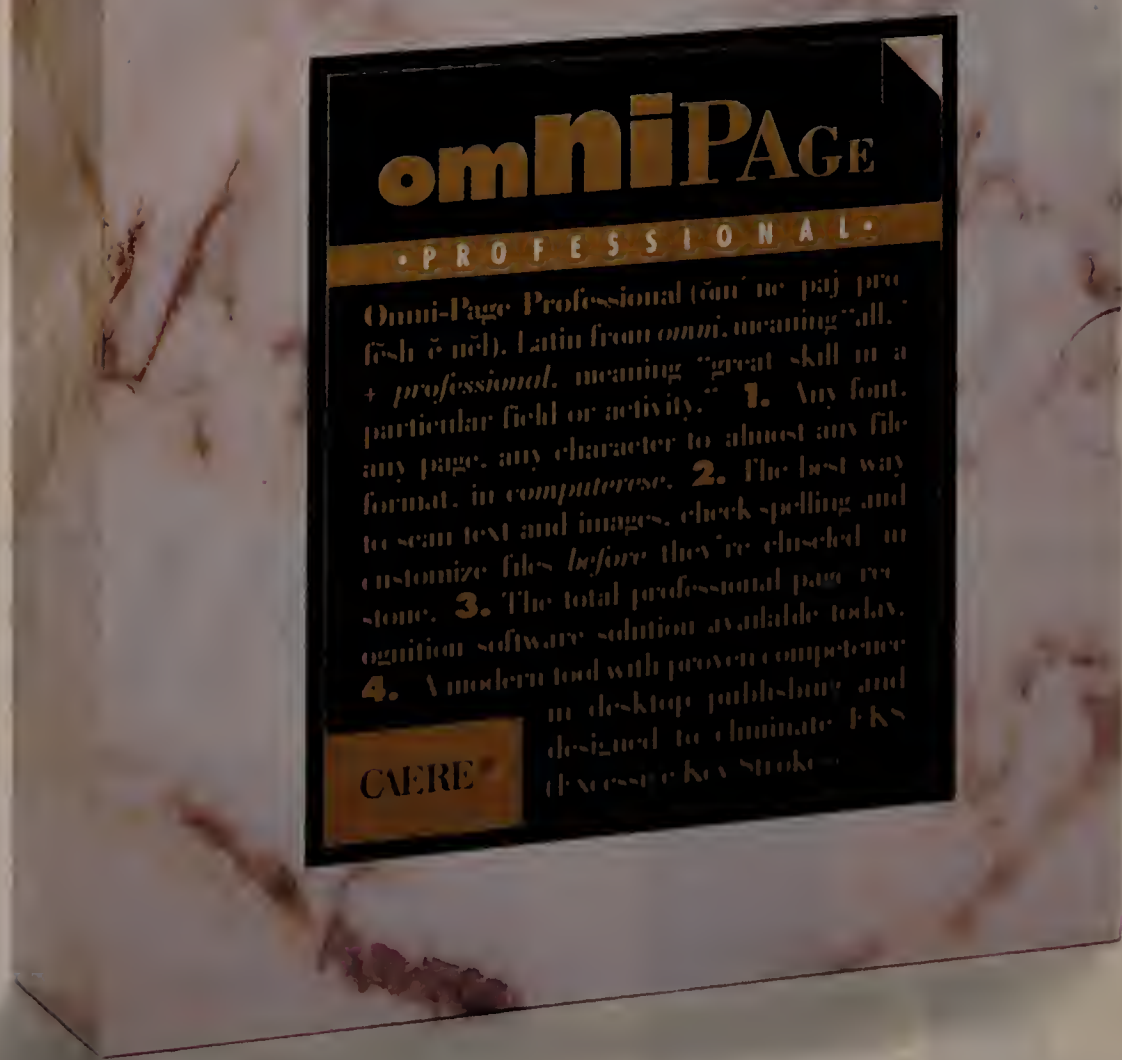

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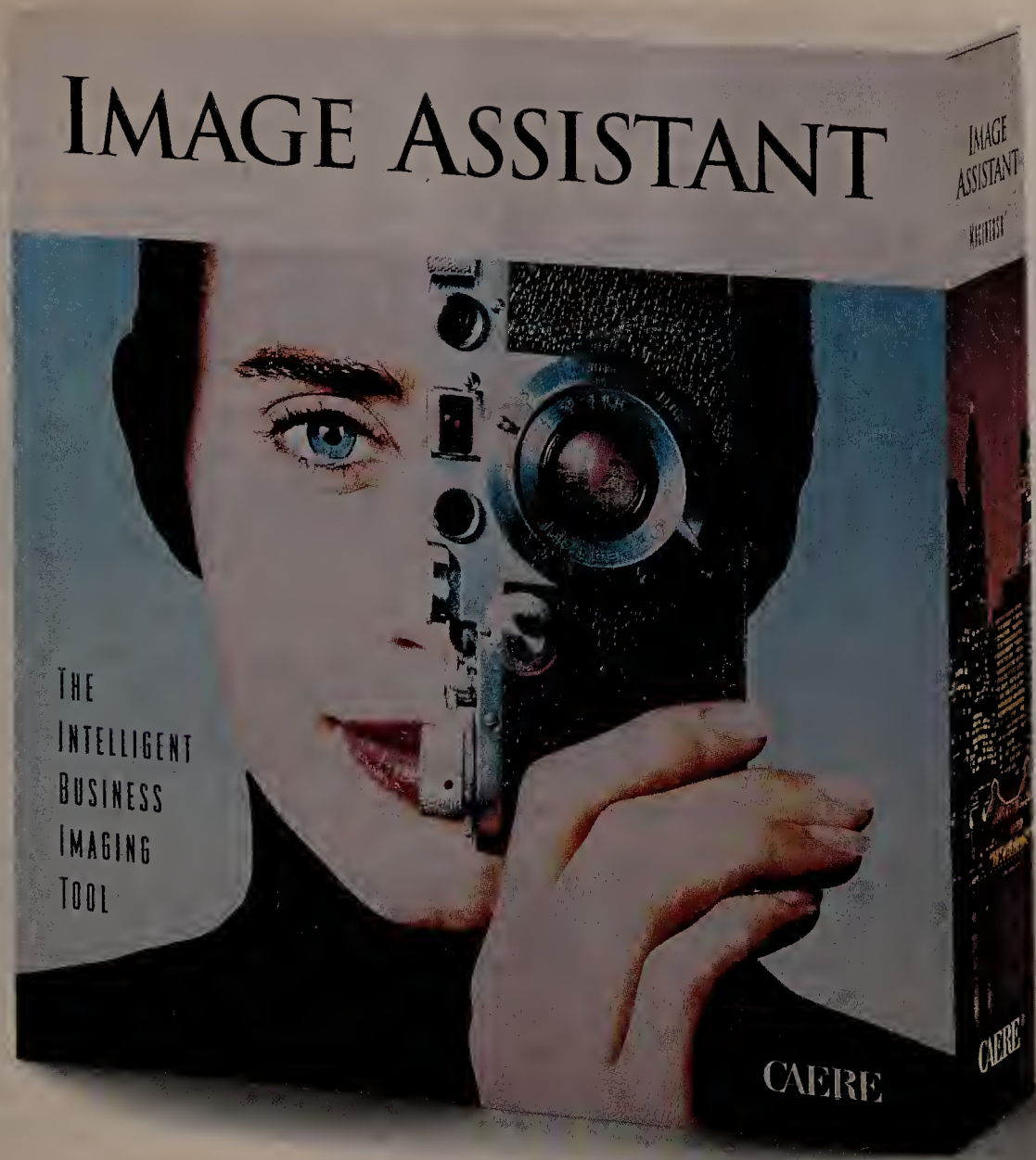

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or black and white images are located, cropped and rotated just as easily. *Image Assistant* is the only color image-editing software for both Windows™ and Macintosh that lets you pick the enhancements that look best to you from a gallery of sample images. You can even "proof" the end result by printing out thumbnail samples that you select.

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Circle 17 on reader service card

grinding to a sickening halt. Maybe you've only lost your work; maybe the megavolt surge that blew your circuit breakers also fried your motherboard.

Don't take chances. Get the ultimate protection—a Back-UPS uninterruptible power supply from APC. These external units do more than simply keep your PC running when the lights go out. They instantly compensate when the power sags (a brownout), prevent line surges from roasting your PC, and do full-time line filtering, which keeps the power running to your PC "clean" and noise free. Better still, the Back-UPS 250 and 400 (which handle 286/386SX and 386/486 systems, respectively) list for a piddling $139 and $229 ($115 and $179 on the street) and come with a lifetime $25,000 hardware replacement policy should the Back-UPS fail.

Even a PC-phobe can install a Back-UPS. I just plugged mine into a grounded outlet, plugged my PC and monitor into the unit, and turned it all on. When a power outage strikes, the Back-UPS will faithfully keep your PC running from 5 to 100 minutes, depending on the system. That's more than enough time to save your work. If a Back-UPS 400 or higher model is connected to a server running NetWare and other LAN operating systems, it can even perform an unattended shutdown. —*Robert Luhn*

American Power Conversion, 800/800-4272, 401/789-5735. List price: Back-UPS 250 $139, Back-UPS 400 $229, Back-UPS 450 $279, Back-UPS 600 $399, Back-UPS 900 $599, Back-UPS 1250 $799; PowerChute network monitoring software $99

Reader service no. 665

Intel RapidCAD

Coprocessor chip set

Intel calls its new RapidCAD chip set an "engineering coprocessor," but I think plenty of nonengineers could use it. I'd recommend this $299 invention to anybody who uses a 386DX to run apps requiring lots of number crunching.

Installing the RapidCAD is not hard: you use the Intel-supplied chip puller to remove your existing 386DX, then replace the original CPU with the larger of the two RapidCAD chips; the smaller one goes in the 387 math coprocessor socket.

The larger chip is a fully powered 386DX processor with a math coprocessor built in; the smaller is a dummy chip that fools the system into thinking a separate math chip is installed. Because the math coprocessor is on the same chip as the processor, time-consuming interchip communications are eliminated, speeding up calculations. In informal tests using *1-2-3* and *AutoCAD*, calculations with the RapidCAD installed ran up to twice as fast as those without.

So why *wouldn't* you want to use the RapidCAD? For one thing, it speeds up only those applications that use floating-point calculations (i.e., numbers with decimal fractions); if you're hoping to rev up *Windows'* glacial performance, for example, RapidCAD won't help much, if at all. Also, if your software *requires* a Weitek math coprocessor, you can't use the RapidCAD, since one of its chips needs to go into the Weitek's socket. —*Brett Glass*

Intel Corp., 800/538-3373, 800/525-3019 (24-hour fax-back service). List price: $299

Reader service no. 666

Intel SatisFaxtion Modem/100

Modem

When my faithful 7-year-old Courier modem sputtered and died a few months ago, I was reluctantly forced to go shopping. I decided right away on an internal modem to help rid my desk of clutter. I didn't intend to get a fax board too, but for only $99 on the street, the 2400-bps SatisFaxtion Modem/100 provides both capabilities in a neat little no-frills package.

Installing the modem is simple: You just set its jumpers to match your COM port and interrupts and stick it in an empty slot. You can then use it with your favorite communications software, or install the included version of *Crosstalk Communicator*.

Sending and receiving faxes, which are limited to ASCII or PCX files, takes a bit more work. You install Intel's fax software and enter the fax numbers you need to dial. Then you can use *Faxpop*, a handy pop-up utility, to send a quick fax from within a DOS application. To send faxes from a *Windows* application, you need Intel's $79 *Faxability Plus* software or another package like Delrina's $119 *Winfax Pro*.

The only drawback: The Modem/100 can't distinguish between incoming voice and fax calls. Intel's high-end products, the $499 Modem/400 and $369 Modem/200, are the way to go if you want the board to answer just the fax calls or route voice calls to an answering machine. But if you mostly need a no-frills modem with some built-in fax capabilities, the Modem/100 is hard to beat for the bucks. —*Anita Amirrezvani*

Intel Corp., 800/538-3373, 800/525-3019 (24-hour fax-back service). List price: Modem/100 $129, Modem/200 $369, Modem/400 $499

Reader service no. 667

QEMM-386

Memory manager

I've used *QEMM* since 1989 when I got my first 386—a blazingly fast 16-MHz Compaq with a massive 2MB of RAM. My task switcher at the time wanted expanded memory, and my Compaq supplied only extended. So I installed Quarterdeck's *QEMM*, which solved the problem by turning the Compaq's extended memory into expanded.

For DOS users who would rather fight than switch to *Windows*, *QEMM-386*'s talents are legendary. It helps free up memory for DOS applications and TSRs that push the limit, and its on-the-fly memory reconfiguration saves having to reboot every time you switch from extended to expanded.

Since *Windows 3.1* came out and I dumped my old task switcher, I seldom need an expanded-memory emulator—but *QEMM*'s other talents still make it very useful. Sure, I could use DOS 5.0's memory management tools to load drivers and TSRs in high memory, but configuring them is pretty tedious. It's far easier to let *QEMM*'s Optimize utility reorganize CONFIG.SYS and AUTOEXEC.BAT automatically. It's also more effective: After loading the drivers for my fax board, CD ROM drive, and disk cache, *QEMM* leaves me 582K free. The best I've done with DOS alone is 525K. —*Robert Lauriston*

Quarterdeck Office Systems, 800/354-3222, 310/392-9851. List price $99.95

Reader service no. 668

Eric Knorr is editor; Steve Fox and Owen Linderholm are senior editors, Michael Goodwin is an associate editor; and Rex Farrance, Dan Miller; and Melissa R. Riofrio are assistant editors for PC World. *Anita Amirrezvani, TJ Byers, Brett Glass, Richard Jantz, Robert Lauriston, Robert Luhn, and Daniel Tynan are contributing editors.*

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Other spreadsheets don't compare

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ORGANIZATION					
Spreadsheet Notebooks	Y	N	N	N	N
Nameable Tabs	Y	N	N	N	N
Group Formatting on Selected Pages	Y*	Y	N	N	N
True 3-D Consolidation	Y	N	Y	N	Y
EASE OF USE					
Right Mouse Button Formatting	Y	Y	N	N	N
Object Inspectors	Y	N	N	N	N
Context-sensitive SpeedBars	Y	Y	Y	N	N
SpeedFill and SpeedFormat	Y	Y	Y*	N	N
Drag and Drop	Y	Y	N	N	N
GRAPHICS AND PRESENTATIONS					
3-D Graphs	Y	Y	N	N	N
Slide Show with Light Table	Y	N	N	N	N
Live Linked Graph Types and Formatting in Slide Shows	Y	N	N	N	N
DATABASE ACCESS					
Live View of Networked Database Tables	Y	N	N	N	N
Database Desktop	Y	N	N	N	N
CUSTOMIZATION					
Macro Buttons on Spreadsheet	Y	Y	N	N	N
Visual User Interface Builder	Y	N	N	N	N
COMPATIBILITY					
Reads Quattro Pro, Excel, 1-2-3 Files and Styles (including Allways & Impress)	Y	N	N	N	N
Runs Your QPro & 1-2-3 Macros†	Y	N	N	N	N
ANALYSIS					
Optimizer	Y	Y	Y	N	Y

*Requires add-in.

†Some 1-2-3 macros may require modification.

Outstanding 1-2-3 and Excel compatibility

Quattro Pro for Windows is the next-generation Windows spreadsheet. It is the *only* spreadsheet that gives you both innovation *and* compatibility with Lotus 1-2-3, Excel, and Quattro Pro. Quattro Pro for Windows supports 1-2-3 files, macros, and publishing styles, including Allways, Impress, and WYSIWYG. It also supports Excel .XLS 3.0 and 4.0 files. What's more, Quattro Pro for Windows is much more compatible with 1-2-3 than Excel. For example, unlike Excel, Quattro Pro formulas, ranges, and command actions (like moving blocks) work as 1-2-3 users would expect.

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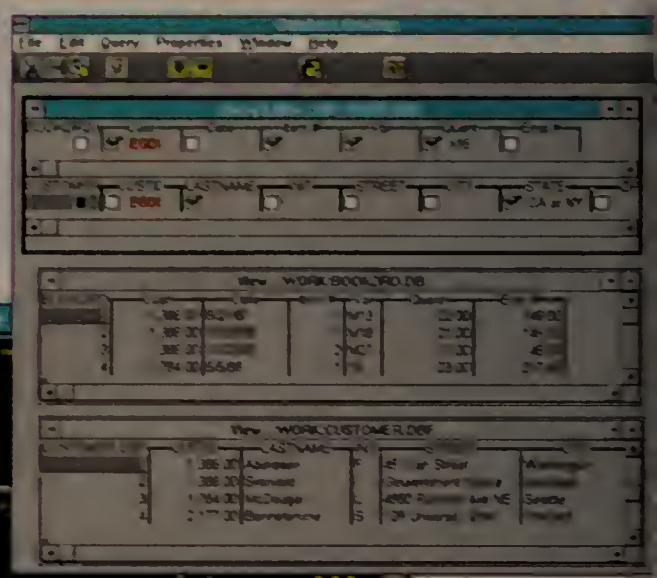
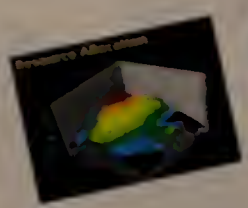


▲ *The Database Desktop: Only Borland makes access to dBASE and Paradox data this easy with QBE.*



Only Quattro Pro for Windows gives you a Light Table to arrange your electronic slide shows in seconds. ▶

1-2-3 and Excel!

ndows has Query By Example, so you ı ask questions about your data with int-and-click ease. Since it's from rland, the database leader, you can ınt on it working right, even in network ironments.

Create custom applications in minutes

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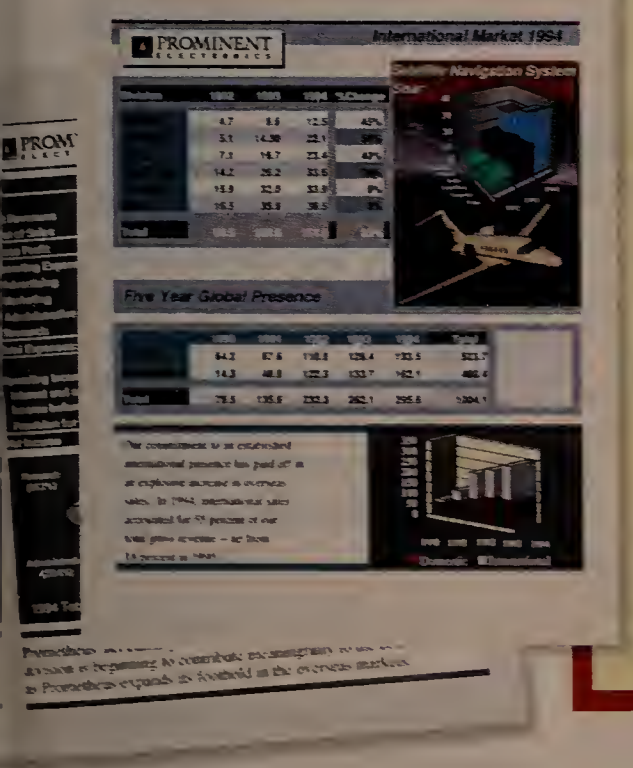
dependent tests conducted by Usability iences Corporation find that two out of ee Windows spreadsheet users tested eferred Quattro Pro for Windows. Don't tle for second best—get Borland's uattro Pro for Windows today!



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Software Craftsmanship

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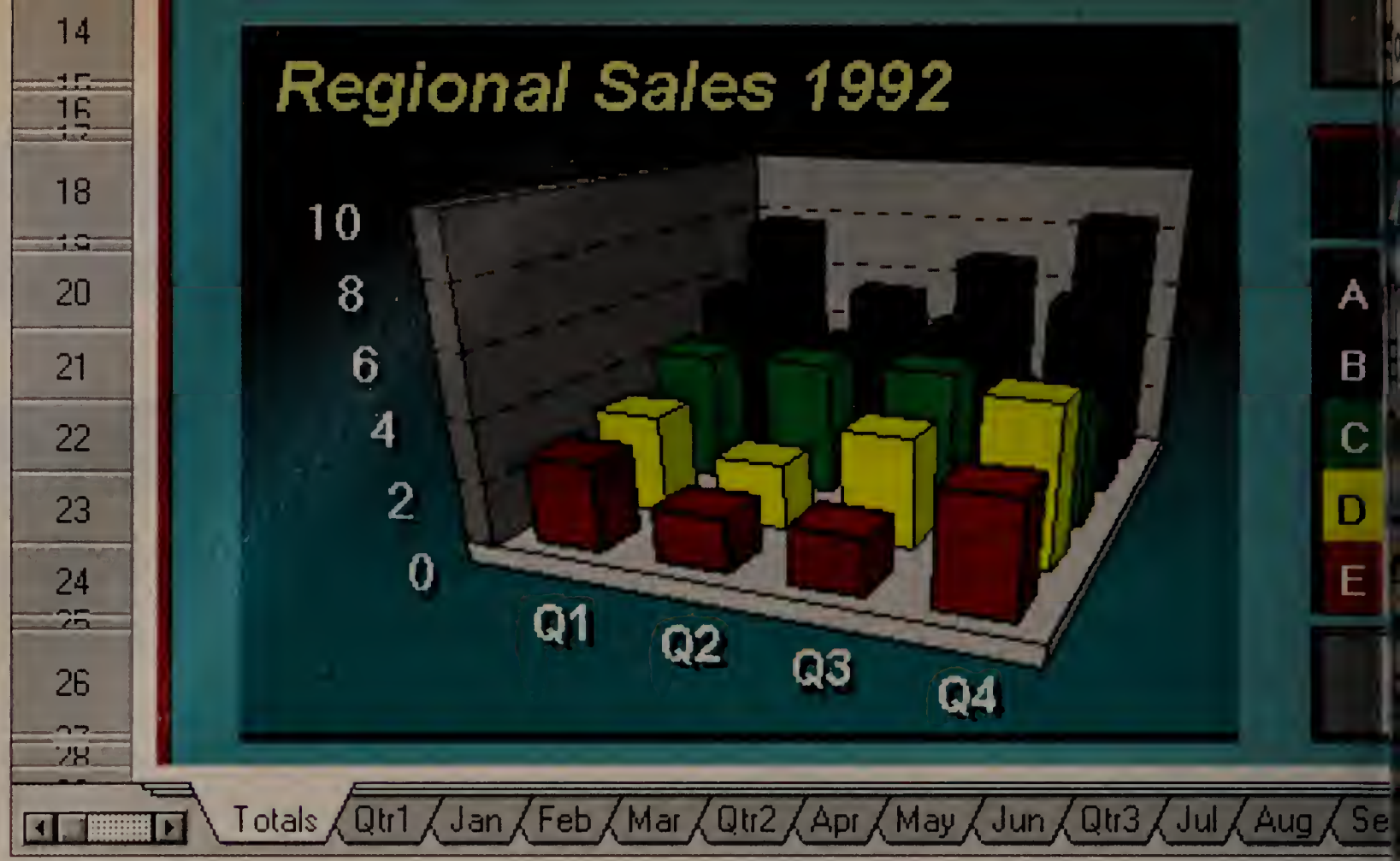
Circle 63 on reader service card



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NEW! Spreadsheet Notebooks* with customizable Tabs are nothing less than a revolution in spreadsheet ease of use. Now you can intuitively organize and manage your spreadsheet data.

NEW! Object Inspector™ menus end the hassle of searching through menus. They're simpler than 1-2-3. Just click the *right* mouse button anywhere on the screen to get a list of what you can change and change it right there.

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SPREADSHEET NOTEBOOKS

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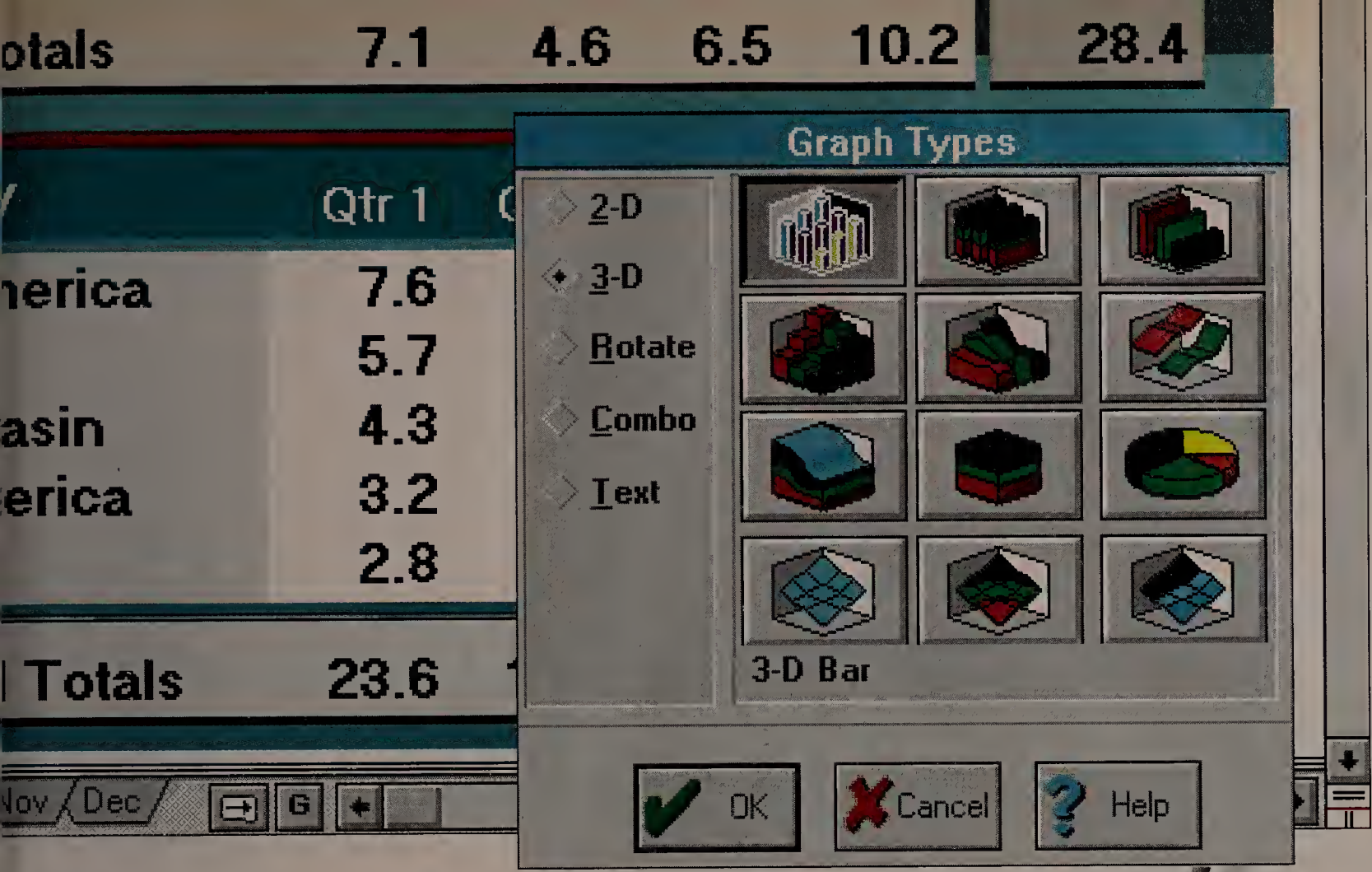

Notebooks

You may never open the manual

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uattro Pro for Windows is the most sable spreadsheet ver. With Quattro ro for Windows' bject-oriented user nterface, every action ou take is easier and faster.

bject Inspector menus let you make ne-step changes to any object on your creen with just a click of the *right* mouse utton—no more searching through lay-rs of pull-down menus.

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Quattro Pro for Windows and Spreadsheet Notebooks have patents pending.

Circle 63 on reader service card

Troubleshooting Windows 3.1

From hiccups to crashes, the dark side of Windows computing has left many of us exasperated. Here's a complete guide to solving 75 of the most vexing problems.

by Robert Lauriston

Windows 3.1 works . . . usually. If you happen to have installed an unlucky combination of hardware and software, running *Windows 3.1* can be an exercise in mystery and frustration. For instance, would you know what to do if only a single character appeared when you tried to paste text from the *Windows* Clipboard into a DOS application? And what does 'Access Denied' mean when you try to create a new directory in File Manager? The answers are quite simple, really. The tricks are asking the right questions and getting good advice. Our handy guide offers just that—the tricks you'll need to tame *Windows 3.1*.

To help you find the answers to your particular questions, we've divided this guide into sections corresponding to the major problem categories. First come general tips for problems not associated with any particular application. These tips are organized by the activity in which the symptoms appear—accessing drives, using your modem, exercising your mouse, printing, and so on. The rest of the guide is devoted to problems you'll encounter when running specific *Windows* applications and running DOS applications under *Windows*. If you have a variety of seemingly unrelated problems, or your symptoms don't correspond to any of those described, try our "Top Ten Troubleshooting Tips."

In most instances, you'll be able to troubleshoot these everyday problems by following the recommended course of action. Since the same apparent

OUT OF MEMORY
GENERAL PROTECTION FAULT
access
CANNOT READ

malfunction can result from a variety of causes, however, we can't guarantee these solutions will work in every case. If a solution doesn't work for you, first contact the appropriate hardware or software vendor or Microsoft for technical support.

If that approach doesn't get you anywhere, or if you are unable to figure out what program or component is causing the problem, drop a line to *PC World*'s *Windows* column. If your vendor fails to provide adequate technical support, contact *Consumer Watch*.

Many of the tips described here require you to edit configuration text files: DOS's CONFIG.SYS and AUTOEXEC.BAT, *Windows'* WIN.INI and SYSTEM.INI files, or program-specific INI files. If you're not experienced at editing such files, be sure to read the sidebar "Using Sysedit" first. Tips relating to DOS apps running under *Windows* often require you to change the application's program information file (PIF) settings. If editing PIFs isn't second nature to you, read "Using Windows' PIF Editor" before getting started.

Conflicts with device drivers or other memory-resident programs are among the most common *Windows 3.1* problems. Fortunately, they're also among the easiest problems to fix: Your vendor sends you a new driver on a disk or you download it by modem, and then you run *Windows'* Setup utility to install it.

Other common *Windows* complaints are slow performance, low-memory warnings, generally quirky behavior, and even system lockup. Such problems often call for a hardware solution. *1-2-3 for Windows*, for example, needs 3MB to run reliably (4MB in standard mode). If you have only 2MB, you'll need to upgrade.

If you already have 4MB, keep an eye on how many programs you have in the background. You may want to reduce the number of programs you load at start-up by moving icons out of the StartUp program group. Also check your WIN.INI file to delete any program names following the equal sign on the LOAD= and RUN= lines.

Drive Confusion

Problem: With *Windows* running under DOS 4.*x*, you receive error message 'Cannot read drive I,' 'Error reading drive I,' or 'Drive I does not exist' when there is no drive I

Solution: Edit AUTOEXEC.BAT to remove the line that loads GRAPHICS.COM. (This will fix the "drive I" problem, but pressing <Shift>-<Print Screen> will now send only text-mode screens to the printer, not graphics-mode screens.) That line might look like any of the following:

GRAPHICS

GRAPHICS LASERJETII C:\DOS\GRAPHICS.PRO

C:\DOS\GRAPHICS

Note: We recommend that anyone experiencing problems while running DOS 4.0 upgrade to DOS 5.0.

Problem: Under NetWare, network drives added using File Manager don't show up in DOS programs

Solution: Open the Networks icon in the Control Panel and check the NWShare handles box.

Problem: 'Cannot read drive A' message or other trouble accessing floppy drives on Compaq Deskpro

Solution: Edit your AUTOEXEC.BAT. Add or modify the SMARTDRV entry to add **-A -B /L**. The new line might look like the following:

C:\WINDOWS\SMARTDRV -A -B /L 1024 512

'A' and 'B' represent your floppy drives. If you have only one floppy drive, you can leave out the '-B'.

Modems and Communications

Problem: Lost characters, file-transfer errors, bad blocks

Solution: If you have SmartDrive's write caching on, it momentarily disables all interrupts when it writes to disk. This "delayed writes" feature can break the flow of data to or from your modem. To disable SmartDrive's delayed writes, try modifying the SMARTDRV entry in AUTOEXEC.BAT to add the drive letter of each hard disk volume on your system. For example, on a system with C:, D:, and E: drives:

C:\WINDOWS\SMARTDRV C D E 1024 512

Problem: Slow performance from a *Windows* communications program

Solution: If you have a serial port with a 16550 UART (check your manual to find out), edit SYSTEM.INI. For each serial port with a 16550 UART, in the [386Enh] section, add or modify the line COM*x*FIFO=1, in which *x* is the number of the COM port. (For example, the entry for COM2 would be COM2FIFO=1.) The entry after COM*x*FIFO= must be 1, not True, On, or Yes, as mistakenly stated in some programs' documentation (386 Enhanced mode only).

Problem: *Windows* communications program worked under *Windows 3.0* but not under *Windows 3.1*

Solution: Load SYSTEM.INI. Look in the [boot] section. If the 'comm.drv=' line says anything but 'comm.drv=comm.drv', you're using an enhanced communications driver that is probably not compatible with *Windows 3.1*. In the [386Enh] section, add the line **COMMDRV30=TRUE**; if a COMMDRV30 line already exists, make sure it reads as above. Alternatively, contact the vendor for a *Windows 3.1*–compatible upgrade to the driver (386 Enhanced mode only).

Problem: Dropped characters, file-transfer errors, slow performance with any *Windows* communications program running in Standard mode

Solution: If possible, reduce the number of drivers and memory-resident utilities loaded by CONFIG.SYS and AUTOEXEC.BAT. Remove the line DOS=HIGH from your CONFIG.SYS. Load SYSTEM.INI, and in the [standard] section add the line **FasterModeSwitch=1**; if a FasterModeSwitch line already exists, modify it to read as shown.

Problem: Dropped characters, file-transfer errors, slow performance from a DOS communications application

Solution: Open the program's PIF file and, in the Advanced section, increase the Foreground Priority. For faster background downloads, increase the Background Priority and (if you have a permanent swap file with 32-bit access enabled) check the Lock Application Memory box (386 Enhanced mode only). In addition, it always helps to run DOS applications full screen rather than in a window.

Dysfunctional Mice

Problem: Pointer appears on screen, but Microsoft mouse won't move it
Solution: Call up MOUSE.INI from the WINDOWS directory. Revise the MouseType= entry to reflect the physical port used by your mouse: **MouseType=Serial1** for COM1, **MouseType=Serial2** for COM2, **MouseType=PS2** for a PS/2-style mouse port, or **MouseType=Bus** for a bus mouse port.

Problem: Mouse works in *Windows* but not in a mousable DOS application
Solution: You need to load MOUSE.COM, either in AUTOEXEC.BAT or before you start *Windows*.

Problem: BallPoint Mouse doesn't work properly after laptop suspend/resume
Solution: Upgrade the laptop's mouse port BIOS. This may be a simple chip swap you

Top Ten Troubleshooting Tips

If you're experiencing frequent *Windows* or application crashes or hangs, or 'Application Error: General Protection Fault' or 'Divide by zero' messages, here are ten configuration changes that remove many common causes of such problems. Even if they don't fix the problem, they may help you track down the cause. One general tip: If you're using DOS 4.*x*, upgrade to DOS 5.0.

1. CONFIG.SYS: HIMEM, EMM386, and SMARTDRV

If you're using HIMEM, EMM386, and/or SMARTDRV, make sure they're the versions that came with *Windows 3.1*, not the ones from DOS or *Windows 3.0* (which are left in your *Windows* directory by the *3.0*-to-*3.1* upgrade utility). For example, if your CONFIG.SYS contains lines beginning as follows:

```
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE
DEVICE=C:\DOS\EMM386.SYS
DEVICE=C:\WINDOWS\EMM386.SYS
DEVICE=C:\DOS\SMARTDRV.SYS
DEVICE=C:\WINDOWS\SMARTDRV.SYS
```

replace them with:

```
DEVICE=C:\WINDOWS\HIMEM.SYS
DEVICE=C:\WINDOWS\EMM386.EXE
INSTALL=C:\WINDOWS\SMARTDRV.EXE
```

You can also leave SMARTDRV out of CONFIG.SYS and add it to AUTOEXEC.BAT. In that case, leave out 'INSTALL=', and don't load SMARTDRV into upper memory with LOADHIGH, LH, or LOADHI.

2. CONFIG.SYS: Redundancy Check

Inspect your CONFIG.SYS and AUTOEXEC.BAT to make sure you aren't loading two disk cache utilities or two memory managers. For example, if you find entries for both SMARTDRV.EXE and SUPERPCK.EXE, or both HIMEM.SYS and QEMM-386.SYS, choose one and delete the other.

3. CONFIG.SYS: FILES

The FILES= entry in CONFIG.SYS should be at least 30. If it already is, try raising it to 60 or even higher. If that doesn't help, set it back again to avoid wasting memory.

4. CONFIG.SYS: SHELL

Increase the DOS environment size to 2K. Modify the SHELL command in your CONFIG.SYS as follows:

```
SHELL=C:\DOS\COMMAND.COM /E:2048 /P
```

5. CONFIG.SYS: STACKS

If *Windows* hangs regularly, make sure the command **STACKS=9,256** is in your CONFIG.SYS. If the problem persists, try **STACKS=9,512**. If it still persists, try **STACKS=64,512**.

6. AUTOEXEC.BAT: TEMP

Make sure that there's a TEMP= statement in AUTOEXEC.BAT (typically TEMP=C:\WINDOWS\TEMP), that the directory referred to by the TEMP variable in your AUTOEXEC.BAT actually exists, and that there's at least 2MB free on that drive. Some tasks, particularly large desktop publishing print jobs, may need additional space—5MB, or even more—so if you have more than one hard drive or logical volume, direct TEMP to the one with the most free space (but not to a network drive). If TEMP points to a RAM disk, try directing it to your hard disk instead.

7. CONFIG.SYS and AUTOEXEC.BAT: Purge Drivers

If you use a third-party memory manager or disk cache, replace it with HIMEM and SMARTDRV. Remove any memory-resident utilities (TSRs) from your AUTOEXEC.BAT. If you're using a super-VGA *Windows* driver, select *Windows'* basic VGA driver. If you're using a third-party printer driver, select one that came with *Windows*. If you're using a scalable font program like *Adobe Type Manager*, turn it off. If *Windows* stops crashing, replace the third-party drivers one by one until you identify the one that's causing the problem.

8. SYSTEM.INI

Edit the SYSTEM.INI file. In the [386Enh] section, modify or add the following entry:

```
EMMExclude=A000-EFFF
```

If this solves your problem, there's probably a conflict between *Windows* and your video or network board, or some other board that is using the upper memory area. Contact the board vendors for help resolving the conflict (386 Enhanced mode only).

9. Shadow RAM

If your system has shadow RAM, disable it, either from your PC's setup utility or by fiddling with a DIP switch or jumper on the motherboard. If that fixes your problem, you may need a BIOS upgrade.

10. Caching Controller

If you have a caching disk controller, disable its hardware cache. If that fixes your problem, contact the manufacturer for help in making the controller compatible with *Windows*.

can do yourself, or it may have to be done by the vendor.

General Windows Oddities

Problem: Icon titles don't wrap even though Wrap Title is checked in Control Panel's Desktop module
Solution: Switch to Program Manager. Select *Options* menu. If Auto Arrange is not checked, select it.

Problem: Corrupted files after system crash
Solution: If your computer crashes and you've been using SmartDrive's delayed writes feature, you can corrupt your drive's file allocation table. To protect against this or to keep it from happening again, edit the SMARTDRV entry in AUTOEXEC.BAT as described in the first entry in the "Modems and Communications" section ("Lost characters, file-transfer errors, bad blocks").

Problem: The message 'Access Denied. Make sure the disk is not full or write-protected' appears when you try to create a directory
Solution: Check to see if there's already a file in the directory with the same name you're trying to give the new directory. If so, move or rename the file, or give the new directory a different name.

Problem: 'The partitioning scheme used on your hard disk prevents the creation of a permanent swap file' message when changing Virtual Memory settings via Control Panel's 386 Enhanced icon
Solution: If you partitioned the drive with third-party software (like Disk Manager, SuperStor, or another operating system like OS/2 or UNIX), contact the vendor of that product. Otherwise, your system's partition table may be infected with a virus. Scan the drive with an up-to-date antivirus utility as soon as possible. (PC World Online features a collection of antivirus software in the Software Library "Virus!" section.)

Problem: Your PS/2 freezes up when you exit *Windows*
Solution: In most cases, the system doesn't really hang—it just takes a minute or so to reinitialize its mouse port. To fix this, edit SYSTEM.INI. In the [386Enh] section, add the line **InitPS2MouseAtExit=FALSE** (386 Enhanced mode only).

Problem: 'Size must be between __ and __ points' message when specifying font size within that range
Solution: Don't use fractions, like 10.5, when you size fonts in this program. If you need fractional sizes, try using a program such as *Microsoft Word* or *WordPerfect for Windows* that supports them.

Problem: 'Call to undefined Dynalink' message when running any *Windows* program
Solution: This error message usually indicates that an application or driver is not fully compatible with *Windows 3.1* and needs to be updated. It also may appear when *Windows 3.0* files have been left on your hard disk after you've upgraded to *Windows 3.1*. The foolproof way to resolve that problem is to reinstall *Windows 3.1* from scratch, then reinstall your applications, utilities, and third-party drivers.

Problem: Various errors, including 'General protection fault' from a *Windows* program using a math coprocessor
Solution: Download an updated version of WIN87EM.DLL from CompuServe or the Microsoft Download Service (206/637-9009 or 206/936-6735 for 9600-bps access). In your WINDOWS\SYSTEM directory, find the old version of the file, rename it, and copy the updated version of the file to the directory.

Making DOS Apps Behave

Problem: When you try to paste text from the clipboard into a DOS application, nothing happens, or only a few characters appear
Solution: Call up the program's PIF file. Click on *Advanced*, and in the Advanced Options dialog box, uncheck Enable Fast Paste (386 Enhanced mode only).

Problem: When you switch out of any DOS program with <Alt>-<Tab>, <Alt>-<Esc>, or <Ctrl>-<Esc>, the application stops running until you switch back
Solution: In the program's PIF file, check the Execution: Background box (386 Enhanced mode only).

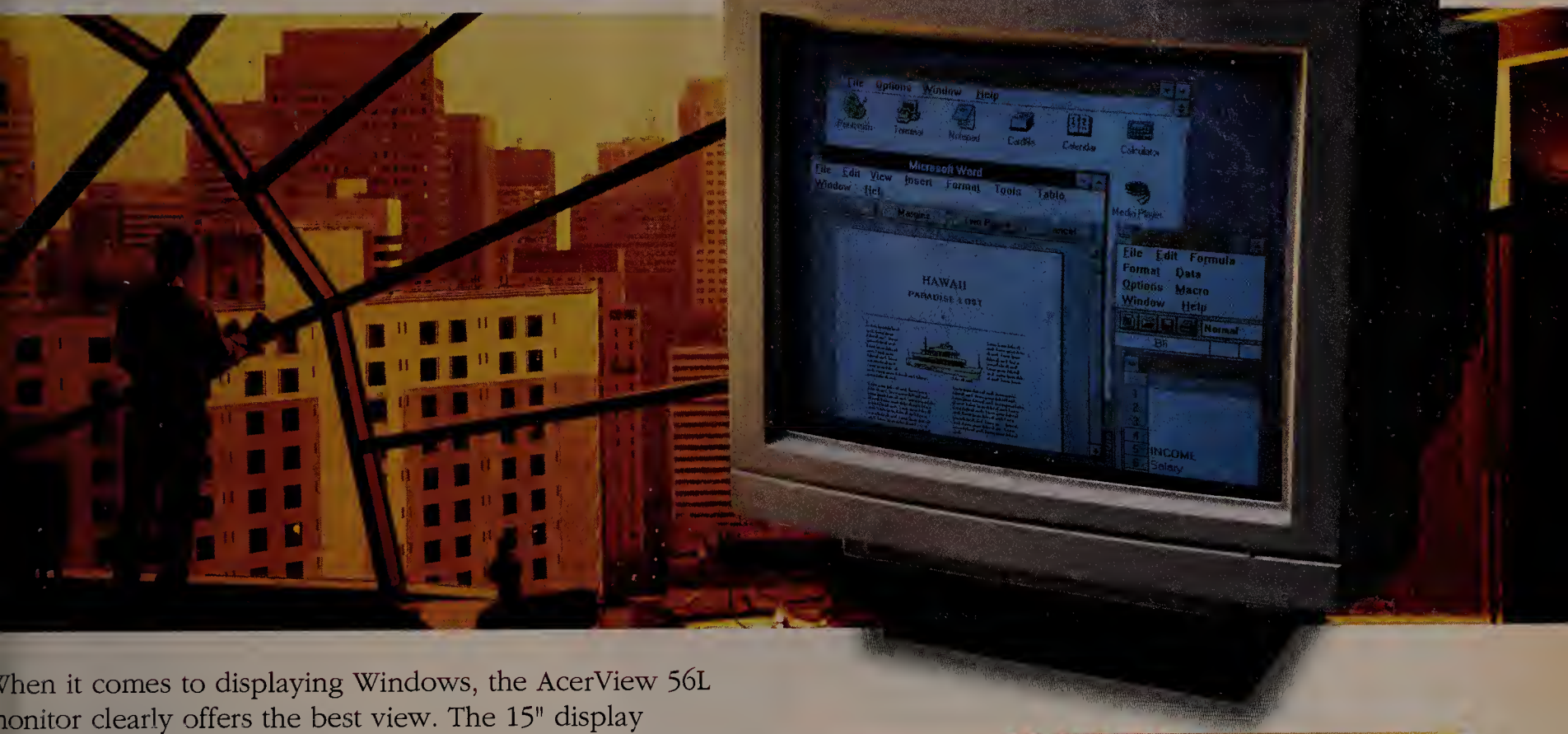
Problem: When you switch out of any DOS program with <Alt>-<Tab>, <Alt>-<Esc>, or <Ctrl>-<Esc>, *Windows* gives you the message, 'You cannot run this program in a window or in the background,' or 'You cannot run this application while other high-resolution applications are running full-screen'
Solution: This usually happens when running *Windows* and/or a DOS application in super-VGA mode. Try switching to the standard VGA driver in Windows Setup and using standard VGA driver in the DOS app. Or try other super-VGA drivers your board supports, like the generic one that comes with *Windows*.

Problem: *Windows* hangs when you switch from DOS application back to *Windows*
Solution: Older Logitech drivers could be the problem. LMOUSE.DRV 5.0 and earlier versions are not compatible with *Windows 3.1*. Use the driver that came with *Windows*, not the one that came with your mouse.

Problem: 'Memory parity error' when starting DOS application under *Windows*
Solution: Normally, a parity error indicates that one of your RAM chips needs to be replaced. However, some older video boards trigger the parity error message when switching modes. If you happen to get this message when starting a DOS application, switching between DOS and *Windows* applications, or switching modes in a DOS application (as when using a character-mode word processor's graphics-mode page preview), you may need to upgrade your video board.

Problem: 'Out of environment space' error when starting a DOS application
Solution: Edit the program's PIF. (If there is no PIF, use Windows Setup to create one.) Double-click on the Program Filename box to highlight its contents, press **<Ctrl>-X** to cut the file name, and type **COMMAND.COM**. Next, position the insertion point at the beginning of the Optional Parameters field, type **/E:2048 /C** and a space, press **<Ctrl>-V** to paste the program file name, type a space, and save the PIF. If you still get the 'Out of environment space' error, increase the

Finally, Windows™ with a Spectacular VIEW.



When it comes to displaying Windows, the AcerView 56L monitor clearly offers the best view. The 15" display features 13% more image area than the standard 14" displays and, combined with its flat tube and .28mm dot pitch, the AcerView 56L offers sharper, clearer, easier to read characters and larger graphics.

The new microprocessor control system provides precise automatic adjustment between video modes once it's set for your graphics card. Its superior non-glare screen enhances contrast and suppresses glare.

The non-interlaced, VESA compliant, low radiation, flicker-free modes increase productivity and make the AcerView 56L a joy to use.

To learn more about the AcerView 56L and the complete line of AcerView monitors, call 1-800-SEE-ACER for the Acer distributor nearest you.

FEATURES

	Features	Benefits
Easy To View	• 13% Larger Image	• Larger Characters/Graphics
	• Flat Square Screen	• Less Distortion
	• Non-Glare Treatment	• Eliminates Annoying Reflection
	• Non-Interlaced VESA Compliant	• Flicker-Free Display
Easy To Use	• Micro Processor Control	• One Time Setup
		• Auto Size and Screen Positioning
Easy To Maintain	• One Year Warranty	• Parts and Labor
Easy On You	• Low Radiation Swedish MPRII Compliant	• Improves Working Environment
	• Ergonomic	• Increases Comfort and Productivity

ACERVIEW MONITOR FAMILY

	76i	56L	35	34T	33D	11G
Screen Size	17"	15"	14"	14"	14"	14"
Resolution	1280x1024 non-interlaced	1024x768 non-interlaced	1024x768 non-interlaced	1024x768 non-interlaced	1024x768 interlaced	640x480
Dot Pitch (mm)	0.28	0.28	0.26 Sony Trinitron®	0.28	0.28	0.39
Horizontal Frequency (KHz)	31-64	31-60	31-57	31/35.5/48	31/35.5	31.5
Compatibility	Ultra VGA, 8514/A, XGA, VGA, VESA	Ultra VGA, 8514/A, XGA, VGA, VESA	Ultra VGA, 8514/A, XGA, VGA, VESA	Ultra VGA, 8514/A, XGA, VGA, VESA	SuperVGA, 8514/A, XGA, VGA	VGA

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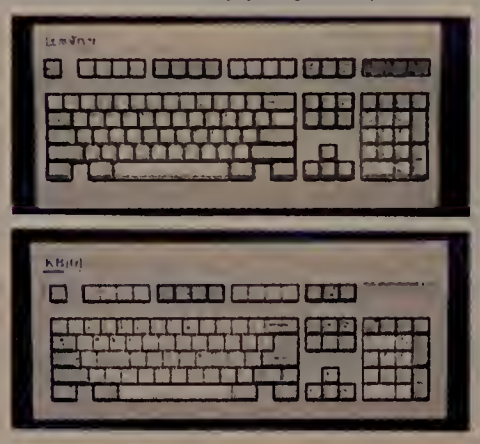

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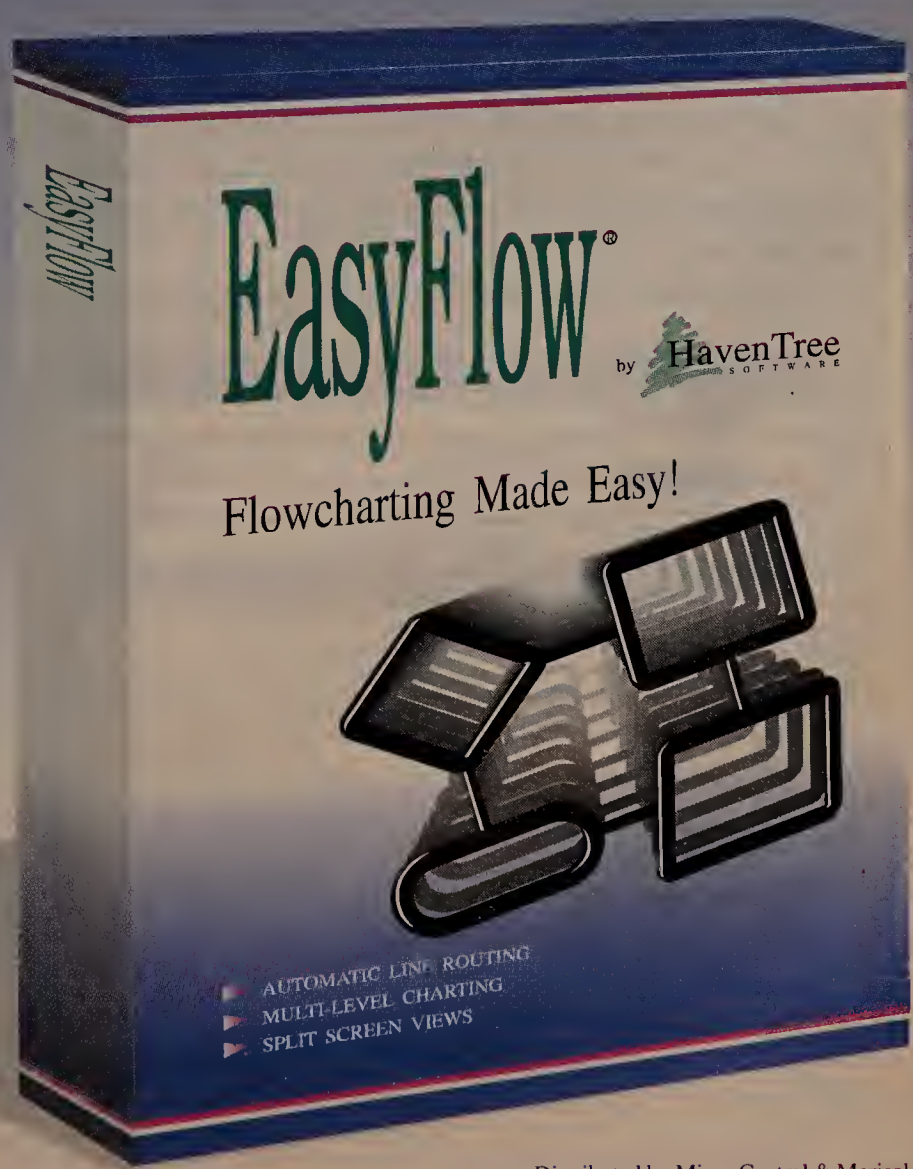

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/E:*xxxx* value by 512 and try again. Repeat until you can start the application successfully.

Proper Printing

Problem: Can't change paper size in Print Setup dialog box in a *Windows* program
Solution: Exit the application, double-click the Control Panel's Printers icon, choose your printer from the list of Installed Printers, select *Setup*, select the size of paper you desire from the Paper Size list, select *OK•Close*, and restart the application.

Problem: Gray-scale graphics print as black in a *Windows* program
Solution: Select *Print Setup•Options*. Adjust the Intensity Control slider toward Lighter, then select *OK•OK*. (This works with Canon, Citizen, Epson, Fujitsu, Hewlett-Packard, IBM, NEC, Okidata, Olivetti, and Panasonic printers that use *Windows'* UNIDRV.DLL driver. If you can't find the Intensity Control, your printer isn't using that driver, and this fix won't work.)

Problem: Can't print landscape page of mixed text and graphics on LaserJet II
Solution: Reduce the FORM LENGTH setting on the printer to 60. Press the printer's ON LINE button in order to take the printer off line, then press the MENU button repeatedly until 'FORM=' appears on the display. Press the "-" button until the display reads 'FORM=60'. Press the printer's ENTER button (* will appear on the right); then press the MENU button repeatedly until '00 READY' appears on the display. Press the CONTINUE/RESET key and hold it down until '07 RESET' appears. Alternatively, upgrade the printer driver.

Problem: Envelopes print upside down on a PostScript printer
Solution: Edit WIN.INI. In the [*name,port*] section that matches the printer (for example, [QMS-PS 810,LPT1]), add the entry **LANDSCAPEORIENT=270**.

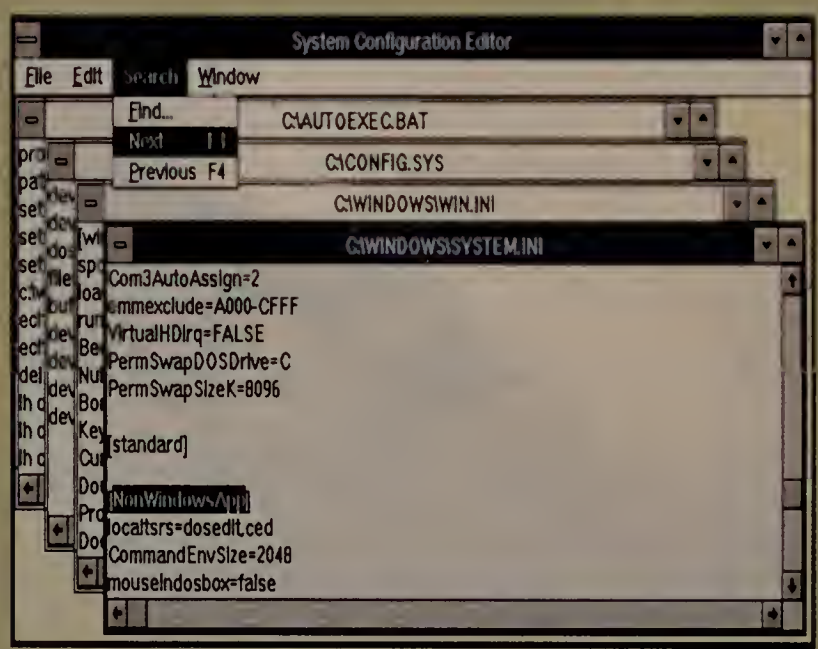
Problem: TIFF graphics come out blank on a PostScript printer
Solution: Convert the TIFF files to DIB format using a graphics program or utility that supports both, like *Paint Shop Pro*, which

Using Sysedit

***Windows* includes a utility, the System Configuration Editor (Sysedit for short), to make it easy to edit the primary DOS and *Windows* configuration text files. Sysedit works almost exactly like Notepad, but when you launch it, it opens four files: AUTOEXEC.BAT, CONFIG.SYS, WIN.INI, and SYSTEM.INI. (The instructions below also apply when editing other INI files with Notepad or another text editor.)**

Setup doesn't add this handy utility to the Program Manager, so many people are unware of its existence. To access it, select *File • Run* from the Program or File Manager, type SYSEDIT, and press <Enter>. For even easier access, open File Manager so that it overlaps Program Manager and, from the WINDOWS/SYSTEM directory, drag the file name SYSEDIT.EXE into the Program Manager Program Group of your choice. *Windows* will insert an icon that you can double-click to run Sysedit.

Before you begin editing configuration files, though, make sure you have a backup boot floppy (at the DOS prompt, enter FORMAT A: /S) so you can reboot your PC in case something goes wrong. And back up the configuration files themselves before editing them, so you can restore the originals if your changes make things worse. To avoid having to restore from a backup set, we suggest you create a BAK subdirectory under your WINDOWS directory and copy \WINDOWS*.INI to \WINDOWS\BAK. Copy CONFIG.SYS and AUTOEXEC.BAT (and COMMAND.COM if your DOS is previous to 5.0) to the boot floppy.



To avoid creating duplicate or conflicting entries, use Sysedit's Search • Find command when looking for a section or setting.

The System Configuration Editor is one of the most useful instruments in your first-aid kit.

WIN.INI and SYSTEM.INI are broken up into various sections. Each section begins with the section name in square brackets, like [boot] and [drivers]. Each section groups related settings, which consist of a keyname (what is being set) and one or more values (the setting), separated by an equal sign. For example, in WIN.INI's [Windows] section, 'spooler=yes' means the Use Print Manager box is checked in the Control Panel's Printers utility, and 'Programs=PIF EXE BAT COM' means that *Windows* will recognize any file with the extension PIF, EXE, BAT, or COM as an executable program. Sometimes sections contain only the bracketed heading and no settings. Likewise, sometimes settings are blank (the keyname and equal sign are there, but there's no value).

Settings must be added under the right section heading or they won't have any effect. If the necessary section or setting keyname does not already exist, you can create it. You must be very careful, however, not to create duplicate sections or keynames.

Some program-specific changes to INI files take effect the next time you start the program, but most don't take effect until you exit *Windows* and restart it. Changes to CONFIG.SYS and AUTOEXEC.BAT don't take effect until you reboot your system.

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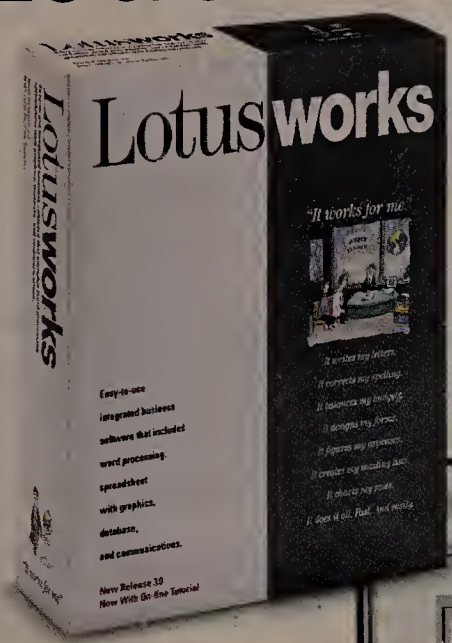

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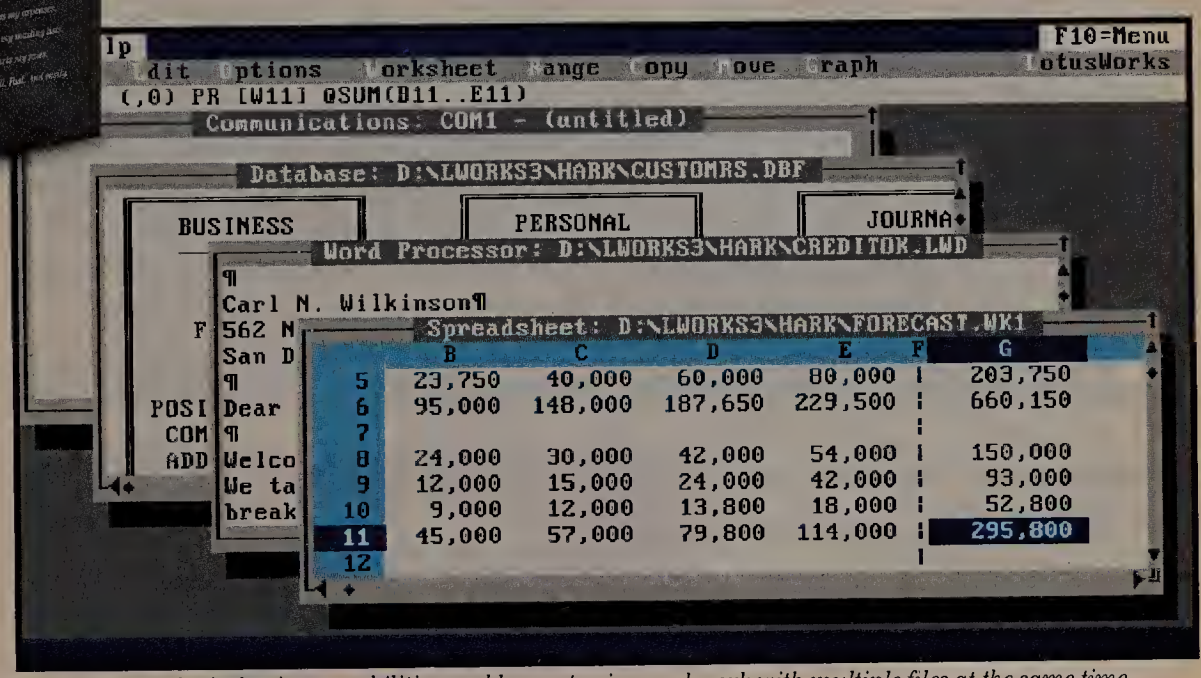

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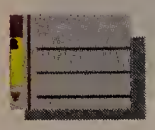

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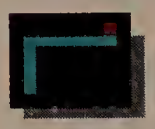

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you can download from the "Featured this Month!" section in PC World Online, or *CorelDraw*.

Problem: False 'retry' messages when printer is processing pages on a PostScript printer
Solution: Double-click the Printers icon in Control Panel, select your printer from the Installed Printers list, and click *Connect*. Change the entry in the Transmission Retry box to 500, check the Fast Printing Direct to Port box, and click *OK*.

Problem: Printer prints start-up test page in the middle of print jobs or displays 'memory full' message on a PostScript printer
Solution: Double-click on the Printers icon in Control Panel, select your printer from the list, select *Setup•Options•Advanced*, check the Use Substitution Table box, then select *OK•OK•OK•Close*. If that doesn't help or the box was already checked, reformat the document using fewer downloaded fonts. If that still doesn't help, you may need to add memory to your printer.

Problem: LaserJet IIID prints second page upside down in large font
Solution: Upgrade to *Windows 3.1* PostScript driver 3.51 or later version.

Problem: 'Offending Command' in printout from IBM printer
Solution: Do not use *Windows 3.1* PostScript driver 3.52 with IBM PostScript printers. Use an earlier or later version instead.

The Mysteries of Video

Problem: Some Program Manager icons appear as black boxes with video boards displaying 65,000 or more colors
Solution: Select the appropriate icon, press **<Alt>-<Enter>**, then **<Enter>**.

Problem: Windows won't boot with Video 7 512K 256-color VGA driver selected
Solution: When you upgrade from *Windows 3.0a* to *3.1*, the new driver (V7VGA.DRV, dated 3/10/92) isn't copied to the SYSTEM directory. To fix this, double-click the Windows Setup icon and select *Options•Change System Settings•Display•Video 7 512K, 640x480 256 colors•OK*. When SETUP asks if you want to use the currently installed driver or a new driver, select *New*. Follow the prompts to update the driver.

Problem: Application errors on 286 system with a TIGA video driver installed
Solution: Switch to a VGA driver under Windows Setup. Then contact the board vendor for a 286-compatible *Windows 3.1* TIGA driver.

System Software

PROGRAM: DR DOS 6.0
Problem: Any
Solution: Install DR DOS's Business Update, which Novell sent to all registered users. If you haven't received your copy, mail in your registration card, or call 800/274-4374.

PROGRAM: NETWARE
Problem: When you start *Windows*, you get the NetWare error message: '*[Server\printqueue]* does not map to any volume/directory path on *[server]*'
Solution: This message appears when a print queue set as Permanent in the Network - Printer Connections dialog box in Control Panel's Printers module has been deleted. To eliminate the message, edit WIN.INI. Under the [Network] section, delete the '*port=*' line that refers to the print queue listed in the error message, and then delete the '*port*-OPTIONS=' line for the same port. For example, if the error message referred to ACCTG\LASERJET, you would delete 'LPT2:=ACCTG\LASERJET' and 'LPT2-OPTIONS= ...'.

PROGRAM: *QEMM-386*
NOTE: For a compendium of tips on using *QEMM-386* with *Windows*, get a copy of Quarterdeck Technical Note #207. You can download it from Quarterdeck's BBS (310/314-3227), the "Featured in November" folder in PC World Online, or CompuServe's QUARTERDECK forum. Look for the file WINFLO.ZIP. *QEMM-386 5.11* and later versions will work with *Windows 3.1*, but you'll need to upgrade to *QEMM-386 6.0* or later if you use DOS 5.0.

Problem: An error message stating 'Windows cannot set up an upper memory block at segment B000'
Solution: Download WINHIRAM.VXD from Quarterdeck's BBS (310/314-3227) and install it according to instructions. Or insert Disk 4 of the *Windows* distribution disks in your A: drive. In Program Manager, select *File•Run*, type **EXPAND A:\MONOUMB2.38_ C:\WINDOWS\SYSTEM\MONOUMB2.386**, and press **<Enter>**. Then edit SYSTEM.INI: In the [386Enh] section, add the line **DEVICE= MONOUMB2.386** (386 Enhanced mode only).

PROGRAM: *QEMM-386*
Problem: *Windows* runs only in Standard mode, not in Enhanced mode
Solution: Run *QEMM*'s QWINFIX utility. If you still can't run in Enhanced mode, try starting *Windows* by using the command WIN /D:XSV. If that fixes the problem, edit the SYSTEM.INI file. In the [386Enh] section, modify or add the following entries:
EMMEXCLUDE=A000-EFFF
SystemROMBreakPoint=False
VirtualHDIrq=False

Windows Software Troubles

PROGRAM: *1-2-3 FOR WINDOWS*
Problem: 'External database driver-specific error' message when querying an external data base; or TrueType fonts not displayed
Solution: Registered users can call Lotus (800/872-3387 ext. 6616) to order a free upgrade to release 1.1.

PROGRAM: *ADOBE TYPE MANAGER*
Problem: Duplicate names in font menu
Solution: Edit the ATM.INI file. If the font names duplicated on the menu appear in both the [Synonym] section and the [Alias] section, delete the [Alias] entry, save the file, and restart *Windows*. Usually the duplicated fonts are Helvetica and Times Roman, in which case you should delete the lines 'HELV=HELVETICA' and 'TMS RMN=TIMES' from the [Alias] section.

PROGRAM: *CORELDRAW*
Problem: Can't copy from Paintbrush using *Windows'* clipboard
Solution: Instead of copying to *Windows'* clipboard in Paintbrush, save the file. Switch to

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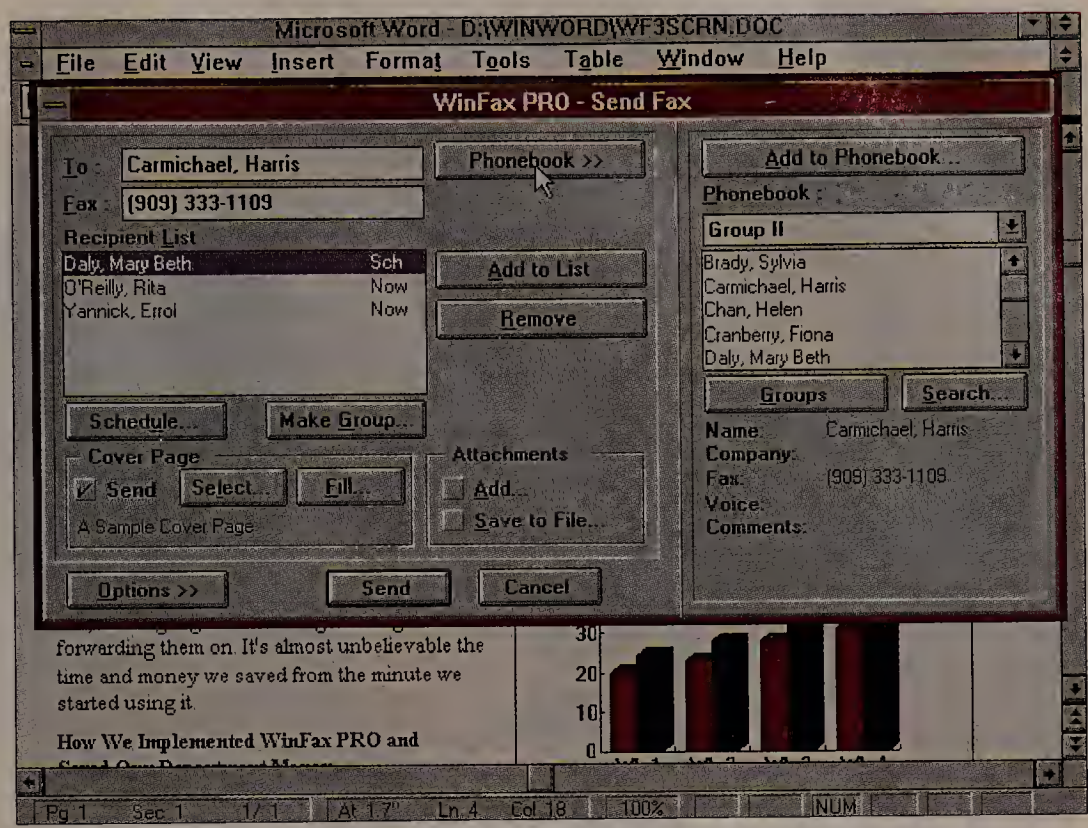

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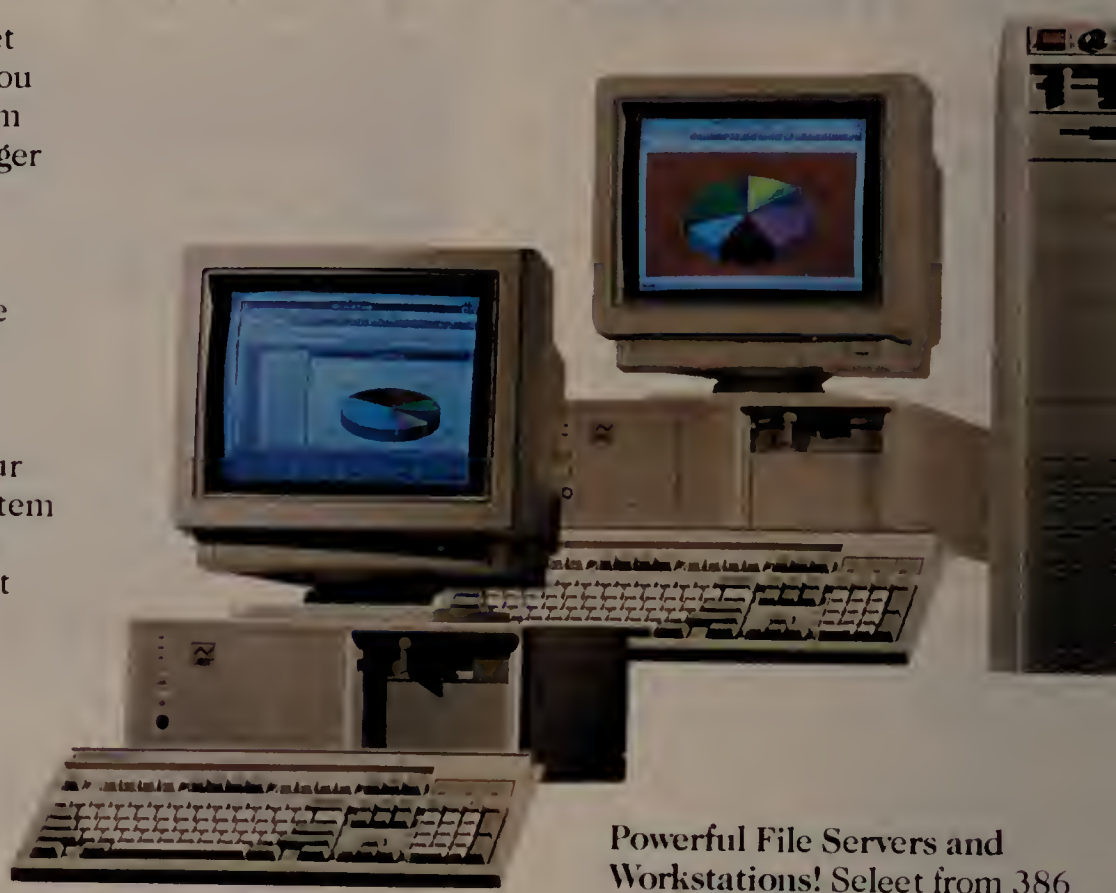

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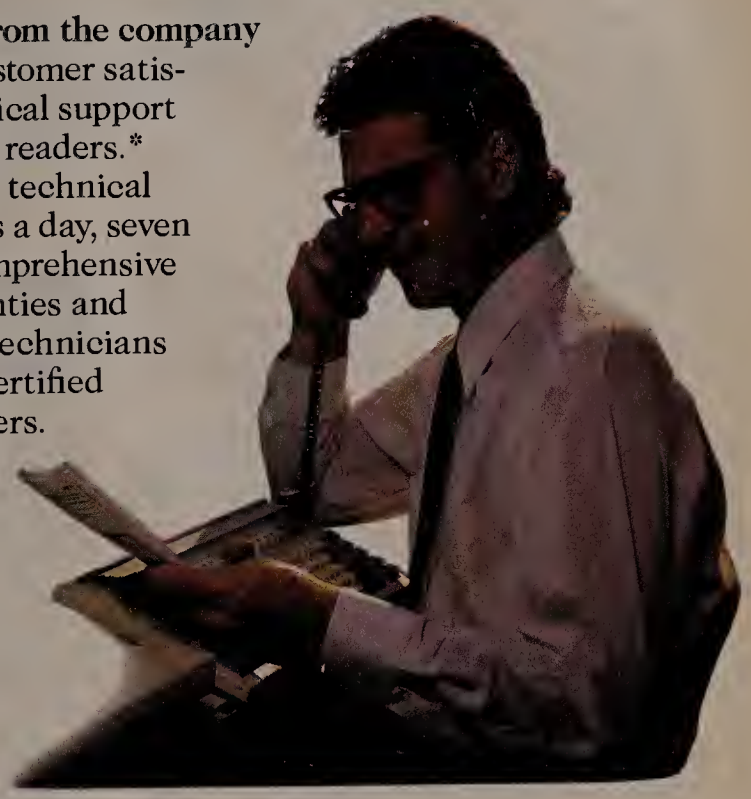

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CODE N4510

CorelDraw, select *File•Import*, select the Paintbrush file you saved, and select *OK*. The image should import correctly.

PROGRAM: *EXCEL 4.0*

Problem: 'Can only run one copy of Setup at a time' message when starting *Excel* Setup

Solution: Delete directory \MS-SETUP.T on the drive where *Excel* is installed.

PROGRAM: *MICROGRAFX CHARISMA*

Problem: 'General protection fault' message when printing a *Micrografx Draw* or an *Aldus PageMaker* document that contains a *Charisma* graphic

Solution: Instead of importing the *Charisma* graphic, copy the graphic to the clipboard and paste it into the other application.

PROGRAM: *MICROPHONE II*

Problem: System reboots when you attempt to use modem, or COM ports unavailable

Solution: Edit SYSTEM.INI's [Boot] section: Change COMM.DRV=COMM_SVC.DRV to **COMM.DRV=COMM.DRV**. Contact Software Ventures (510/644-3232) to get an upgrade to its enhanced communications driver.

PROGRAM: *MICROSOFT WORD FOR WINDOWS*

Problem: Can't switch bins on laser printer; em and en dashes appear as regular dashes, bullet appears as *o*, white-on-black 8 in WingDings font appears as double 6

Solution: Registered users can call 800/426-9400 to upgrade to version 2.0a or later.

PROGRAM: *MICROSOFT WORD FOR WINDOWS*

Problem: 'Out of memory' error and can't save while editing document with pages in both portrait and landscape

Solution: Don't leave a PostScript printer selected while working on mixed-orientation documents. From *WinWord*, select *File•Print Setup* and choose the HP LaserJet III (you can install the driver even if you don't have that printer). Switch back to the PostScript driver before you print.

PROGRAM: *PAGEMAKER 4.0*

Problem: After restoring a minimized document, the page is black

Solution: Select *Element•Define Colors•Paper* and click *OK*. To avoid a recurrence, don't use a 256-color video driver.

PROGRAM: *PAGEMAKER 4.0*

Problem: 'General protection fault' message when printing several open files

Solution: Close each file before opening the next one you want to print.

PROGRAM: *PAGEMAKER 4.0*

Problem: 'General protection fault' message when printing document containing leaders with tabs

Solution: Limit the type size of leaders with tabs to 6.5 points or less.

PROGRAM: *WINDOWS 3.1 SOFTWARE DEVELOPMENT KIT*

Problem: Keyboard locks when you close an application being debugged with CodeView

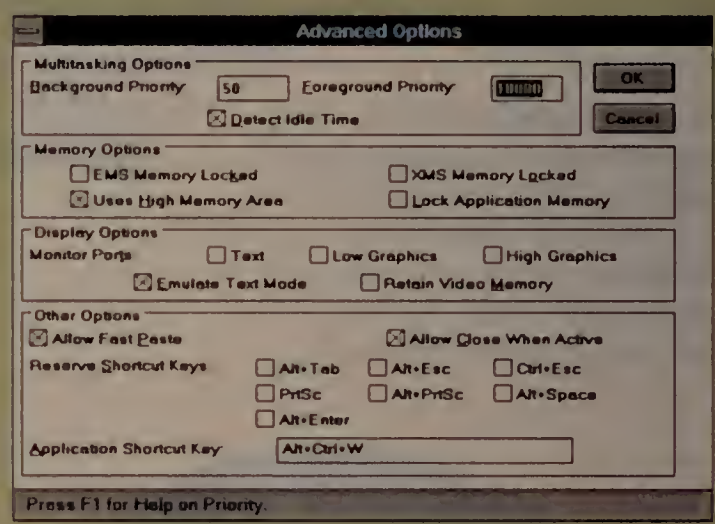
Solution: Close CodeView before you close the application; don't run DOS apps (or go to command line) while using CodeView.

PROGRAM: *WINDOWS WRITE*

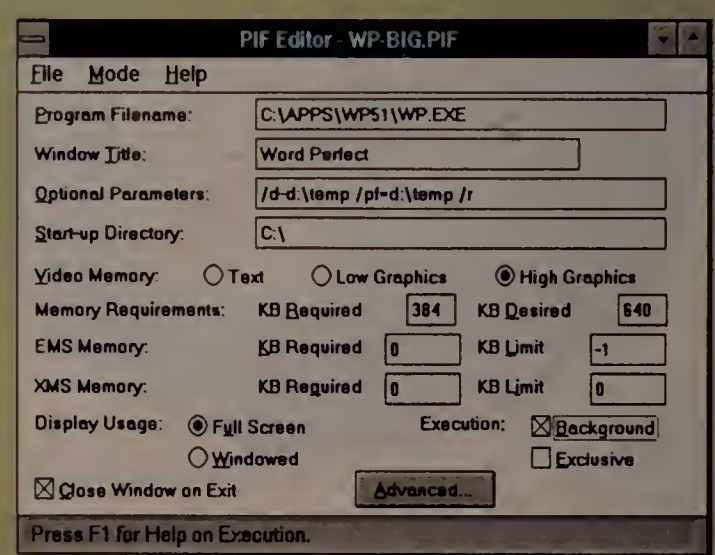
Problem: Inserting a *Microsoft Draw* object

Using Windows' PIF Editor

A program information file (PIF) tells *Windows* how to handle a particular DOS application or batch file. PIFs are normally stored in the *Windows* directory or in the same directory with the program. If you wish, you can create multiple PIFs with different settings for the same program. To change PIF settings, you use *Windows* PIF Editor, which Setup installs in the Main program group. If a program has no PIF, or you bypass the PIF by running the program's EXE or COM file directly, *Windows* uses the settings in _DEFAULT.PIF.



Generally, you need to edit only a PIF's Advanced Options to fine-tune *Windows* multitasking or to troubleshoot problems. The '10000' is the maximum value for Foreground Priority, which means that *WordPerfect* gets almost all the CPU's attention when the application is running full screen. That number is so large only because this PIF is optimized for best performance when you're editing large documents; the standard WP.PIF setting is 100. Use the 'Allow Close When Active' setting with care. When you check that box, you're giving *Windows* permission to shut down without forcing you to first close the DOS application in question.



This PIF shows the settings you'll typically change when troubleshooting *Windows*. When creating a PIF, the only fields you must fill in are Program Filename and Window Title. Also, some programs won't work properly unless the Start-up Directory matches the path in Program Filename. The -1 EMS Limit here means *Windows* will give *WordPerfect* all the expanded memory it asks for. The most common change: Check the Background box to get a program to run in the background. Typical background tasks include printing documents and downloading files.

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gives message 'ED: An error has occurred in your application . . . Close/Ignore'
Solution: This problem is reportedly specific to the LaserJet III printer driver. Select another printer before inserting a *Microsoft Draw* object.

PROGRAM: *WORDPERFECT FOR WINDOWS*
Problem: Text scrolls off right edge of screen; word spacing on screen doesn't match printout; can't access Symbol or WingDings fonts; graphics disappear, are scrambled, or don't print correctly; or general protection fault occurs when using File Find
Solution: Registered users should call WordPerfect at 800/321-4566 to order a copy of the 4/30/92 interim release.

PROGRAM: *WORDPERFECT FOR WINDOWS*
Problem: Envelope macro doesn't work, or third-party fonts don't appear in menu
Solution: Select a *WordPerfect* driver for your printer. *WordPerfect for Windows* can use either *Windows* printer drivers or its own *WordPerfect 5.1*–compatible printer drivers. The Envelope macro that ships with *WordPerfect for Windows* works only with *WordPerfect* printer drivers. *Adobe Type Manager* and *Bitstream FaceLift* fonts are available only when an application is using the *Windows* drivers. To shift between the two drivers, select *File•Select Printer*, click the *WordPerfect* or *Windows* radio button, and click *Select*.

The Unruly World of DOS Software

PROGRAM: *1-2-3 3.X*
Problem: 'System software does not follow VCPI or DPMI specification' message when trying to start 1-2-3
Solution: Edit CONFIG.SYS. Change the line DEVICE=C:\WINDOWS\EMM386-

Software and Hardware Compatibility

Owners of the following applications should upgrade to at least the indicated versions for reliable performance under *Windows 3.1*. Most *Windows 3.0* super-VGA drivers, mouse drivers, and screen savers won't work properly with *3.1* and must be upgraded as well. You can get *3.1*-compatible drivers from Microsoft's Windows Driver Library, available on CompuServe, GEnie, Microsoft OnLine, or the Microsoft electronic download service at 206/637-9009 or 206/936-6735 for 9600-bps access. If you don't have a modem, disk versions of the drivers are available from Microsoft at 800/426-9400; the disk version of the library costs $20 and is updated quarterly.

Applications
Accpac Simply Accounting for Windows 1.0f
AceFile 1.01
Adobe Illustrator 4.0
Adobe TypeAlign 2.1
Aldus FreeHand 3.0
Aldus Persuasion 2.1
Ami Pro 2.0
Arts & Letters Graphics Editor 3.11
Bitstream FaceLift 2.0, 5/3/92 update
Borland C 3.1
Carbon Copy 1.0b
Close-Up 4.01
Command Post 7.2
Compaq CEMM.EXE 5.09
CorelDraw 2.001
Diamond Stealth VRAM video driver 2.0
DR DOS 6.0 Business Update
Fastback for Windows 1.01
Faxit 2.5
Forest & Trees 2.0b
hDC Power Launcher 2.0
Hollywood 2.0
HP DeskScan II 1.51
HP LaserJet III driver (HPPCL5C.DRV) 1.02
HyperAccess 5.2.1
IBM PC-DOS 3.1 or 5.0
Intellifont for Windows 1.20
Legacy 2.0
Lotus 1-2-3 3.1 (all 1-2-3 2.*x* versions are compatible)
Lotus 1-2-3 for Windows 1.1
Microsoft CD ROM Extensions (MSCDEX-.EXE) 2.21
Microsoft Bookshelf 1991
Microsoft Excel 4.0
Microsoft Multimedia Development Kit
WaveEdit 1.0b
Microsoft PowerPoint
Microsoft Publisher
Microsoft Word for Windows 2.0
MoreFonts 3.051
MS-DOS 3.1
Norton Desktop for Windows 2.0
Norton Utilities 6.01
OmniPage Professional 2.0
On Target 1.0.1
OnTime 1.1
PackRat 4.0
PC Tools 7.2
PFS:WindowWorks 1.3
Publisher's Powerpak 1.57
Professional Oracle 6.0
ReachOut 3.0
Relay Gold 5.0b
Rumba 3270 Emulation 3.1.04
ToolBook 1.53
Stacker 2.0
SuperPrint 2.2
SuperStor 1.3h
WinSpeed 1.03
Wired for Sound Pro
WordPerfect 5.1 for Windows interim release 4/30/92
WordStar for Windows 1.5

Check the following list to see if you have one of these BIOS's, ROMs, or chip sets. The dates and version numbers represent the earliest release for which each product has demonstrated full *3.1* compatibility. The information was gathered from the Microsoft Knowledge Base and is not a comprehensive list of which products and brands will function under *Windows 3.1*.

AMI 4/9/90
AST Premium 286 2.0
ATI 8514-Ultra ROM #1330111330
Award 3.05
DTK 386 BIOS 4.26
Grid 1550SX laptop, April 1991
Kyocera F Series Printers 6.32
Peak/DM 1.30
Phoenix 1989
Quadtel 3.05, 12/18/90
Tandon BIOS types 009 and 209 require version 3.8
Toshiba T3200/20 4.2
Toshiba 3100e 1.70
Zenith 386 16 2.6E
Zenith TurboSport 386 2.4D

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.EXE NOEMS so that it reads as follows: **DEVICE=C:\WINDOWS\EMM386.EXE RAM.**

PROGRAM: *HARVARD GRAPHICS*

Problem: Runs very slowly

Solution: Run the PIF Editor and open the *Harvard Graphics* PIF (usually HG.PIF). Click the Advanced button. Under Display Options, check Text and uncheck High Graphics, then click *OK•File•Save* (386 Enhanced mode only). This last setting is unnecessary and slows the program down.

PROGRAM: *MICROSOFT FORTRAN 5.1 APPLICATIONS*

Problem: Won't run

Solution: Place the letters *REM* before the line APPLOADER _MSLANGLOAD or delete it from the FORTRAN definitions file, then recompile the program. Note that the new program will not run properly under *Windows 3.0*.

PROGRAM: *MICROSOFT WORD*

Problem: 'There is no text in clipboard' message when pasting text from *Word* into another DOS application

Solution: Change *Word*'s display mode from graphics to text before you try copying text to the clipboard.

PROGRAM: *MICROSOFT WORD*

Problem: 'System Integrity Violation' error message

Solution: Open *Word*'s PIF (usually WORD-.PIF), change both EMS Memory fields (KB Required and KB Limit) to **0**, and save the file (386 Enhanced mode only).

PROGRAM: *MICROSOFT WORD*

Problem: Mouse pointer and cursor become scrambled after switch from full screen to window

Solution: Load the mouse driver with the command **MOUSE /Y** in AUTOEXEC.BAT or with the batch file you use to start *Word*.

PROGRAM: *MICROSOFT WORD 4.0*

Problem: Key gets stuck and repeats after switch to *Word* from another application

Solution: Upgrade to version 5.x.

PROGRAM: *WORDPERFECT 5.1*

Problem: When program runs in a window, the mouse doesn't track correctly

Solution: Shut off *WordPerfect*'s internal mouse acceleration. From the menu, select *File•Setup•Mouse•Acceleration Factor* (or press **<Shift>-<F1> MA**), type **1**, and press **<Enter>** three times. Each time you start *WordPerfect* in a window, touch the right, left, and bottom sides of the window with the mouse cursor, then move the cursor to the window's upper-left corner.

PROGRAM: *WORDPERFECT OFFICE*

Problem: Can't start Office Shell from File Manager or Run menu

Solution: To run Shell under *Windows*, you have to launch it with a PIF file. You can create PIFs for all *Office*'s modules automatically from the Control Panel's Windows Setup module by selecting *Set Up Applications* and following the instructions.

Robert Lauriston is a contributing editor and Richard Melville an editorial intern for PC World. *Our thanks to the technical support departments of Lotus, Microsoft, and WordPerfect for their invaluable assistance in researching this article.* ■

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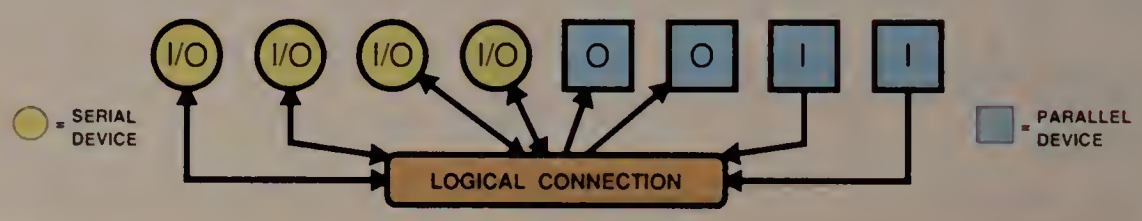

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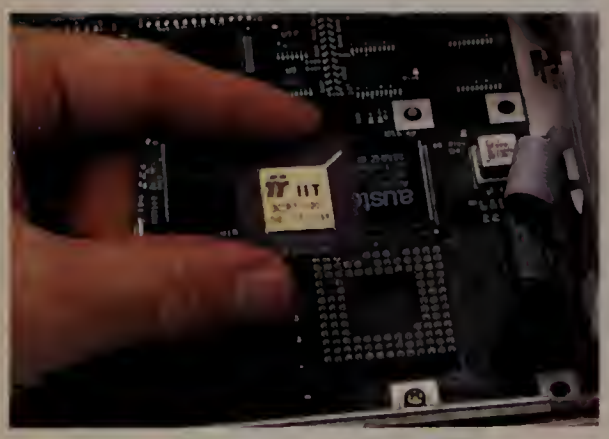

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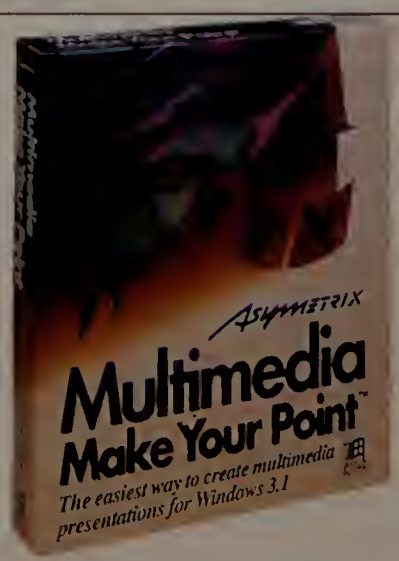

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So how does it work? It's actually very simple. The racle software contains game-like exercises that ke learning fun. Like the shooting range that knocks ducks when you hit the right notes. You'll learn to y chords as parachutists jump out of a plane and rn melodies by repeating back what the Miracle ys. It's so much fun that you'll actually forget that 're learning. The next thing you know, you'll be play- your favorite songs. The Miracle provides instant dback as you go, recognizing problem areas and nging up specific drills to help you get it right. If 're struggling in a certain area, The Miracle con- ues to provide arcade-like lessons in that area until u get it right. It's not boring, tedious labor — it's actu- y fun. And that means faster learning and visible ogress.

When you've mastered a specific skill, The Miracle ickly moves on to the next level, with new games, vivid w screens and new musical concepts.

If you love music, and always wanted to play the ano -- here's you're chance. And it's never too late to arn with The Miracle, adults learn as quickly as chil- en because they work at their own speed, building on ills quickly -- on their own schedule. It's the power of ur computer at work in an important role: learning.

TigerSoftware sweetens The Miracle's charms with bundle that's simply unbeatable. You get the Miracle yboard, software — plus the Miracle Song Collection you can play along with your favorites from The Bea- es, Michael Jackson, Buddy Holly, Lionel Richie, eorge Michael and more. We'll also include the Mira- e Keyboard stand, stereo headphones and a free copy TRAX, the advanced MIDI recording software that ansforms your computer into a multi-track recording udio. With TRAX, you can record and mix multiple acks, add additional instruments and effects, add vo- ls, change the tempo—and do it all from your key- oard. Record up to 64 tracks with a host of tape corder-like controls. Compose and edit your own nes by just cutting and pasting notes on your screen. RAX is simple to use and delivers professional results.

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The Only Self-Teaching Piano.

The Miracle Piano Teaching System can teach anyone — child or adult — to play the piano with a series of progressive, customized lessons. The Miracle quickly connects to a Macintosh or PC and includes software cartridge that combines an advanced MIDI keyboard with full-stereo sound and brilliant on-screen graphics. In no time at all, students of all ages will learn and perform left and right handed melodies — while having a lot of fun!

There are exercises, musical pieces and drills (cleverly disguised as games), that teach hand positions, notes, fingering, rhythm, scales and more. The Miracle can be quickly set up for any age or expertise, and customizes itself to move the user along at a comfortable pace.

Unlike conventional piano lessons, The Miracle eliminates boring, repetitive routines. The super-creative, artificially intelligent software quickly teaches the basics and builds on them in very entertaining ways. And that makes all the difference.

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But That's Not All.

You also get the Miracle keyboard stand. With all this, you'll be ready to create your own live performance or cut your own record.

With The Miracle, you or your child can learn to play without the boring drills and monotonous practice that music usually requires.

So not only do you enjoy the benefits of the world's most exciting piano teaching system, with The Miracle Song Collection, you get an educational jukebox with 40 more ways to play to learn instead of just learning to play.

A Professional Instrument That Grows With You

The Miracle is not only an ideal tool for learning, it delivers lasting value as a high-quality, sophisticated musical instrument. With over 100 other instruments available, and a built-in stereo sound system, you can make an entire orchestra come to life whenever you play. As you grow as a musician, The Miracle is compatible with all modern synthesizers through built-in MIDI connections. (That's Musical Instrument Digital Interface, the worldwide standard for computerized music.)

"The Miracle is a delightful and irresistible path into the joy of making music..."
Professor Martin Canin
The Julliard School of Music

HERE'S WHAT YOU GET FREE WHEN YOU BUY MIRACLE:

Miracle Song Collection Volume 1	$49.95
Miracle Song Collection Volume 2	$49.95
Trax Midi Recording Studio	$99.95
Trax Midi Song Collection	$49.95
Miracle Stand	$34.95
Carrying Case	$49.95
Total Value Included Free	**$334.70**

MIRACLE

BCT3877	**Miracle PC Bundle**	**$399.00**
BCT2877	**Miracle Mac Bundle**	**$349.00**

Circle 214 on reader service card

TIGERSOFTWARE CD-ROM

THE CDR-73 $349

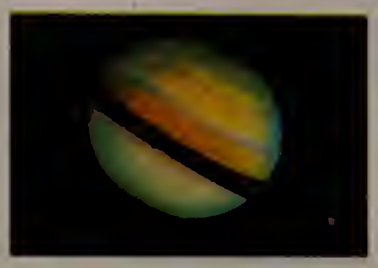
REVIEWER'S NOTEBOOK: *If you're ready to get into CD-ROM, Tiger has a spectacular offer on the fastest reader in the business. The NEC CDR-73, with a remarkable 350 millisecond response time — for just $349!*

The only thing left to buy is the interface kit (deeply discounted to just $159, including cables, earphones and the hot new CD Speedway that accelerates your CD-ROM drive up to 1000%) and you have the hottest drive in the business — ready to rip into megabytes of data.

We've assembled two low-cost bundles of the most popular CD-ROM titles into what we call the Tiger Starter Packs. Starter Pack I includes: World Atlas, U.S. Atlas and Automap, Reference Library, Time Compact Almanac, Toolworks Illustrated Encyclopedia, Guinness Disc of Records, Q&A and our own TigerSoftware Demos. Plus, we'll throw in a pair of Persona Micro Speakers.

Starter Pack II includes: Bible Library, Mammals, The Time Table of History: Science and Innovation, U.S. History, Family Doctor, Sherlock Holmes, Game Pack II, Wing Commander & Ultima VI, Loom and Monkey Island. That's over $1650 worth of current CD-ROM software and accessories for just — are you ready for this? — Just $199!

The Toolworks Illustrated Encyclopedia. Critically acclaimed and widely used, The Toolworks Illustrated Encyclopedia features the entire text of a 21-volume encyclopedia — stored on a single compact disc! The Toolworks Illustrated Encyclopedia allows searches by title, word, or phrase of the latest information on science, contemporary life, law, sports, and much more. Over 30,000 articles enrich this highly regarded reference.



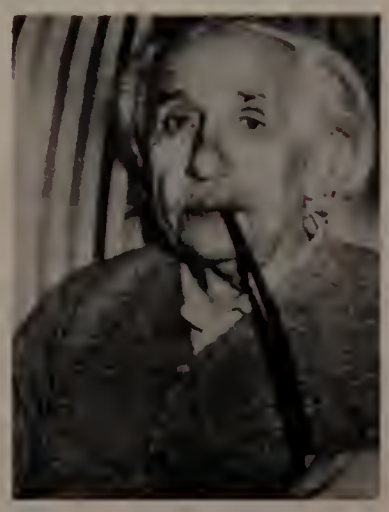
Guinness Disc of Records. Based on the all-time best-selling *Guinness Book of Records*, this CD-ROM makes it easy to locate over 7,000 world records on every topic — from sports to business to natural events (and many unnatural events). Often fascinating and always fun, you can find unique facts about every aspect of the human experience.

U.S. Atlas and Automap. With *U.S. Atlas* simply click on a state or select a city to explore information such as tourism, population and highways — more than 200 topics in 10 categories. With Automap, you get clear, detailed maps that can get you anywhere in the United States that you want to go.

National Geographic Mammals: A Multimedia Encyclopedia. See animated sequences and full-color photos of everything from an aardvark to a zebra. This title brings you closer than you thought possible to a variety of our world's most intriguing animals.

Loom. New — from Lucasfilm Games! In a truly unique fantasy graphic adventure, you play the role of a young Weaver in the Age of the Great Guilds. *Loom* is a tale of magic, music, and dragons that's unlike any other game.

Toolworks Reference Library. A complete home and office reference library on a single compact disc. For the writer, student, business person, educator or trivia buff it's an endless source of information. Reference the most respected and sought-after sources, including: *Webster's New World Dictionary, 3rd College Edition, Webster's New World Thesaurus, The New York Public Library Desk Reference, Dictionary of 20th Century History, J.K. Lasser's Legal and Corporation Forms for the Sma Business, Webster's New World Guide to Concise Writing a* much more.



Sherlock Holmes. The world's greatest detective, Sh lock Holmes, along with Dr. Watson plunge headl into their greatest cases. The entire treasury of Sir thur Conan Doyle's classic tales on a single CD.

NEC CDR-73

INTERFACE KIT

Interface with cables	$199.0
Earphones	19.9
CD Speedway	99.9
TOTAL RETAIL VALUE	$318.9

TIGER SPECIAL — JUST $159

STARTER PACK I

Persona Micro Speakers	$ 80.0
World Atlas	149.0
U.S. Atlas & Automap	99.9
Reference Library	149.9
Time Compact Almanac	199.9
Toolworks Illustrated Encyclopedia	395.0
Guinness Disc of Records	79.9
Q&A	399.0
TigerSoftware Demos	99.9
TOTAL RETAIL VALUE	$1652.7

TIGER SPECIAL — JUST $199

STARTER PACK II

Bible Library	$595.0
Mammals	149.0
Time Table: Science and Innovation	99.9
U.S. History	395.0
Family Doctor	79.9
Sherlock Holmes	69.9
Game Pack II	79.9
Wing Commander & Ultima VI	99.9
Loom	79.9
Monkey Island	79.9
TOTAL RETAIL VALUE	$1728.6

TIGER SPECIAL — JUST $199

BCT4760 **CDR-73 Drive** Interface not included	**$349.0**
BCT4761 **PC Interface Kit** Includes Cables, Earphones & CD Speedway	**$159.0**
BCT4762 **Starter Pack I**	**$199.0**
BCT4763 **Starter Pack II**	**$199.0**

Circle 214 on reader service card

Turn Any Fax Into A Full Page Scanner!

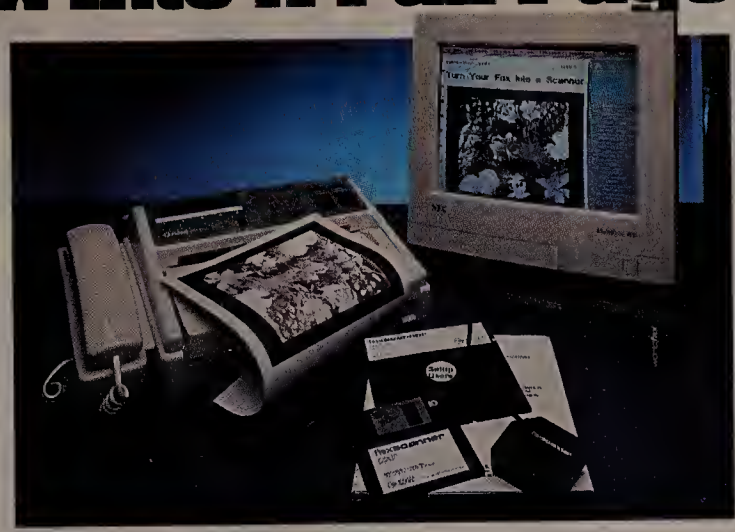
n, Print, Send And Receive — From A Fax Machine!

EWER'S NOTEBOOK: *It's not everyday something new comes along, but here's an ingenious breakgh: a little black box the size of a Chunky chocolate hat lets you use your portable (or desktop) com- to scan, fax and print using a fax machine! Imagou're on the road and all you need is your laptop. second, you plug into a hotel or office fax machine tisfy all your scanning and printing needs. With nachines popping up in airports, hotels, supermarnd office supply stores all over world, you'll never thout scanning or printing facilities again.*

roducing a new era in truly portable computing: AX SCANNER. This 1⅞"×2¼"×⅞" wonder- e connects your computer and fax/modem to standard fax machine (Group III, the most com- around) for incredible scanning power. This sys- is the best solution we've ever seen for quality scans for faxing. The superb gray-scale es and crisp, clear text are simply unbeatable. ried with the best full-page scanners to duplicate SCANNER's quality, but it just didn't compare. ything about it is fine tuned for faxing.

can up to a full 11"×17" size with the included ware. Save it as a .PCX image file, then import scanned image into PageMaker or virtually any l processor. You get all the power of a full-page ner, including 16 levels of gray, and 300 dpi qual- n a tiny pocket-size package.

AX SCANNER is a software/hardware package connects your computer's internal fax board or et fax modem to a stand-alone fax machine. FAX NNER's little black box connects the two, and



the included software provides an easy menu for fast, flawless scans; scans that are engineered for high-quality faxes. But now that you've made the connection, that's only the beginning...

Use A Fax To Scan And Print!

For the ultimate in light-traveling convenience, add printing power to a fax machine. FAX PRINTER is an add-on to FAX SCANNER and turns a fax machine into a high-quality laser printer. Print spreadsheets, pictures and any document at a sharp 200 dots per inch. When using WorldFAX Software with the FAX SCANNER, it turns your fax machine into a laser-quality printer!

WorldFAX Software

Here's the easiest way we've seen to create and send a fax from DOS. From the true WYSIWYG display with scalable fonts, to the ability to import an image with effortless simplicity, WorldFAX is world-class fax software.

WorldFAX allows you to easily use your existing fax/modem to compose outgoing faxes and silently receive faxes in the background. Need just the right font to add spice to your fax? Select any size, bold, underline, use italics or combinations to get just the right look for your fax. Later on, if you decide you want more fonts, you can select from the huge font library from Atech Software.

A Solution To Fit Any Fax.

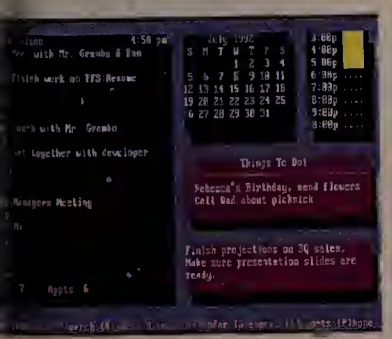
Tiger offers a bundle to fit every fax situation. Whether you just need to scan — scan and print — or scan, print, send and receive — we have a package designed with you in mind. If you don't yet have an internal fax board or pocket fax modem for your computer, we have a top-of-the-line pocket fax modem that was selected precisely for this package — offering trouble-free service for years to come.

FAX SCANNER/FAX PRINTER WORLD FAX

BCT6290 **FAX SCANNER** (Turns your FAX into a scanner) **$69.00**
BCT6291 **WorldFAX Software** (Use with your FAX board) **$99.00**
BCT6292 **WorldFAX Software Bundle** Includes...
FAX SCANNER (Turns your FAX into a scanner)
FAX Printer (Lets you use a FAX machine as a printer)
and WorldFAX Software **$149.00**
BCT6293 **Above Bundle (FAX SCANNER, Printer, and WorldFAX Software) PLUS a Pocket FAX Modem** **$249.00**
Requires hard disk and VGA monitor.

e Super Calendar!

IEWER'S NOTEBOOK: *Finally, a k, powerful scheduling system 's truly easy to use. In fact, About e is easier and more flexible than other software attempt we've seen nd actually more convenient than ten calendars. It offers a unique concept in scheduling multiple ble and resources, with daily, kly, monthly and yearly breakns, instant viewing and in-depth nagement of time and schedules. ate an unlimited number of calens on a PC or network. Print out r entire staff's calendars in one keyke! Group Calendars, Appointnts, Memos, Reminders and Things Do are tracked for you — just "jot m down anywhere" in About Time.*



Create recurring appointments.

ABOUT TIME

BCT3301 **About Time** (Single User) **$79.90**
BCT3302 **About Time Network** **$295.00**

Raise A Child Who Loves To Read!

Phonics Plus (Ages 4-8). This title makes a lively game of working with vowels and consonants. Colorful screens, friendly characters, various play and learning levels.

2nd Math (Ages 7-16). Mathematics is easy and fun when children are taught with personalized learning tools. That's the secret of 2nd Math, a wonderful software program filled with car races, puzzles, and more.

The Speed-Reading Course For Your PC!

BookMaster SpeedReading is a PC program that not only improves the speed of your reading, but increases your comprehension as well.

BookMaster SpeedReader includes reading selections from authors like Jack London (Call of The Wild), Mark Twain (Tom Sawyer), Sir Arthur Conan Doyle (Sherlock Holmes mysteries) and many more. Each selection begins with a "Vocabulary Preview" Session designed to eliminate stumbling over unknown words.

STONE & ASSOCIATES

BCT3286 **Phonics Plus** ... **$39.95**
BCT3287 **2nd Math** **$49.95**
BCT4700 **BookMaster SpeedReader** ... **$59.90**
Call for system requirements.

The NUMBER ONE Forms Package!

FormTool's list of users is interesting. It includes a who's who of American Business. **Boeing, Ford, 3M, Motorola, NASA, Kodak,** just to name a few. It's the perfect product to "just sit down and make a form."

FormTool Gold is easy to use. In fact, FormTool Gold is legendary for its fast, easy operation. Its powerful drawing tools are forms-oriented, so most of the work is automatic, and a new Forms Manager keeps every form organized and updated.

FORMTOOL GOLD

BCT1020 **FormTool 3.0** **$79.00**

The Computer Time Machine

What was going on in the world the day you made your entrance? Who was on the top of the music charts? The year's best in sports and who was electrifying the silver screen and more? Just enter your birth date and instantly News Of The Past displays and prints a complete rundown of significant events in a handsome, framable format.

A great gift, perfect party activity — even a lucrative business opportunity!

NEWS OF THE PAST

BCT3289 **News Of The Past** **$49.95**

New! Create Standalone Mini-Spreadsheets

Baler Express actually enables you to create tamperproof spreadsheets that you can distribute (or SELL) to others, regardless of what spreadsheet they have, even if they don't have a spreadsheet.

You create your worksheet as you normally would, then with just a few keystrokes Baler Express "compiles" into secure, self-running (.EXE) files.

BALER EXPRESS

BCT6238 **Baler Express** **$99.99**

Make Your CD-ROM Reader Up To 1000% Faster

Just released and available only through TigerSoftware. One of the hottest breakthroughs in computing! The software solution to CD-ROM slowdown that increases your CD-ROM reader's speed by up to 1000%...The smartest new innovation to CD-ROM this year...Tested 100% compatible with the leading readers on the market today, including NEC, Sony and Chinon.

CD SPEEDWAY

BCT8500 **CD Speedway** **$99.00**
Call for system requirements.

Information & Order Hotline **1-800-888-4437**
M-F 8am-Midnight, Sat. 8:30am-8pm & Sun. 11am-5pm (EST)

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THE NEC OPTIMIZED

Pre-Loaded With Your Favorite Software, Completely Configured By The E

REVIEWER'S NOTEBOOK: *This is an entirely new way to purchase a PC. Tiger engineers have spend almost a year putting these breakthrough PC packages together. I am very proud to present the Tiger/NEC SuperSystems. You CANNOT buy a system in this way from anyone else.*

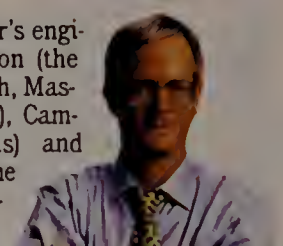
Why? Because we've taken the industry's fastest, most reliable and best built machines (the NEC 486 PowerMate Image Series) and given them the ultimate in added value. We've loaded the software onto the hard drive for you — but more importantly, we've assembled the engineers and programmers who DESIGNED THE HARDWARE and WROTE THE SOFTWARE to configure and optimize each computer we sell for maximum efficiency and ease-of-use. That means your new system is tweaked and tuned for Windows 3.1 by the insiders who know it best. And make no mistake, Windows can be a strange animal. You could spend weeks setting up your machine — and still not be able to optimize it like we have. Or, you could hire a consultant or VAR (Value Added Reseller) to do it for you — and spend thousands — and you still wouldn't get the same performance. They just don't know what the original software developer knows...

NEC, Lotus, Symantec, Logitech, Microsoft And Tiger Combine To Create The "Perfect Computer."

Your system comes out of the box set up, tested and ready to run, with hundreds of system enhancements. Turn it on and Norton Desktop is at your service. Meet-

INCLUDES
120MB Hard Drive and 4MB RAM

ings have been held with Tiger's engineers in Redmond, Washington (the home of Microsoft), Boxborough, Massachusetts (the home of NEC), Cambridge (the home of Lotus) and Cupertino, California (the home of Symantec) for the sole purpose of creating machines with the perfect configuration. They are customized by factory specialists, working from a set of specifications etched in stone by the most advanced thinkers in the industry.



Why Buy A Machine That's Only Half-Baked?

No one else in the industry has taken the time to put your machine together like this. At best, they simply load the software onto the machine and ship it. And while DELL, Zeos and other computer resellers claim that they sell computers that have "exclusive" compatibility with various software and are guaranteed, only Tiger has individually OPTIMIZED and tested your machine for peak performance. And our guarantee? ONE YEAR, ON-SITE! Beat that. Isn't that what today's competitive world needs?

A More Solid Guarantee Than Anyone Else CAN Offer.

The fact is, when other computer resellers ship your machine without carefully configuring your software, it makes a difference in how your system works, how Windows performs and how much you get done.

486 Horsepower In A Variety Of Flavors.

Why only 486 machines? Our research has found that the 386, although brilliant technology, is already dead. Why settle for a 386 when a lightning fast 486 is just $100 more? With Intel's aggressive pricing, buying a 386 is like buying a four-year-old car for just $100 less than a brand new one. Our competitors can make more money on those 1980s-vintage, 386 machines — but that's not what we do at Tiger. We want our customers to have the best at a reasonable price.

The NEC PowerMate Image Series.

The NEC 486 machines fly — in both Windows and DOS. They come with the legendary performance of a world-class Intel microprocessor, the best in the business. You can choose from 25Mhz, 33Mhz or blast off with the 486/50Mhz monster. The PowerMate Series features NEC's Image Video, which is local bus technology for faster screen displays. Local Bus means that your video bypasses the system's expansion bus (running at only 8Mhz) and goes directly to the processor, running at full system speed. Of all PC components, this video enhancement gives you the greatest boost. Word processing documents, graphics, spreadsheets — everything — ex-

plodes onto your screen like never before. T technology increases screen performance by T TIMES. NEC was the first, and you won't get this b in advantage with the competitors.

The standard machines ship with 4MB of RAM, a Tiger will expand that for you to either 8 or 12MB. get a 120MB hard drive and 3.5" disk drive. Check price box for these system upgrades.

By the way, we customize your system to the me ory you choose as well. The 4MB version will be co gured for maximum performance, with a different se specs for the 8MB machine. Dozens of technical hancements will be made to your system depending your memory and storage choices. No one else e thinks of doing that.

What Do We Actually Do?

Over 100 individual enhancements are made to y system to improve performance. Among these enhan

ments is a precise consolidation of the programs we lo for reduced path travel and faster, more efficient comp ing. We remove all the unnecessary filters and driv that just sit there and take up space. We streamline Windows parameter files and locate the SWAPFILES the optimum place for both DOS and Windows. It to months to achieve this, working with the original dev opers, engineers and programmers. We also confi the memory to maximize your computer's interleavi routines and install RAMDRIVE on systems with a thing over 6MB.

For Windows, we've taken the little mysteries out the 3.1 environment, so you won't have to spend mont trying to track down hang-ups and incompatibiliti With other computers, you're left on your own to re the industry magazines and technical manuals to do yourself.

We've learned things about Windows 3.1 that only small handful of industry insiders know about — a build them into your system before we ship.

NEC: Synonymous With Reliability

These systems will be the state-of-the-art for a lo time. NEC computers are designed and built in the US in NEC's Boxborough facility. They are exhaustive tested and re-tested to perform as promised. These m chines are NOT built in Asia and re-labeled in Ameri The United States leads the world in computer techn ogy — and that's where these NEC machines come fro Each part is premium quality, because your computer only as reliable as its smallest part.

UPGRADE YOUR HARD DRIVE FROM 120MB TO 240MB FOR JUST $200 MORE!

UPGRADE YOUR MEMORY FROM 4MB TO 8MB FOR JUST $299 MORE OR TO 12MB FOR JUST $599!

Call Our PC Specia **1-800-395-8443** Int'l Orders: 305-443-8212 Fax: 305-529-2990 We Ship Via Federal Express

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8am-Midnight, Sat. 8:30am-8pm & Sun. 11am-5pm (EST)

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486SX/25i: $2295!

t NEC, Lotus, Symantec And Microsoft. Optimized For Instant Productivity.

THE TIGER/NEC BUSINESS BUNDLE

This is where it gets interesting. The Business Bun- includes your choice of the NEC PowerMate 486SX/ i, 486/33i or 486/50i with over $2500 in free, mpletely optimized software, loaded and ready to run. e start with Windows 3.1, the graphical user interface m Microsoft. We also include DOS 5.0, the ultimate erating system, along with an Logitech mouse and indEase, a Windows 3.1 tutorial system — learn erything you need to know in less than an hour!

Then there's SmartSuite from Lotus. This is the ttest package in the business — including new otus 1-2-3 Release 1.1 for Windows, the incredible indows spreadsheet that's swept the industry since s introduction; Ami Pro, the visual word processor; otus Freelance for Windows, the smart, easy presen- tion package and now — cc:Mail, the LAN-based ectronic mail system.

This package is aimed squarely at savvy business sers, bringing cc:Mail to network environments and nlocking new horizons in productivity and conven- nce. The cc:Mail single-user pack included in Smart- uite is ready to go, for instant communication on any C or LAN you have.

SmartSuite also features a consistent set of icons, enus, tool — and of course, SmartIcons, so it all works gether in a seamless, smooth fashion. Pass informa- on easily between 1-2-3 and Ami Pro, or on to Free- nce Graphics.

FREE Adobe Type Manager is included for crisp, clean fonts as well as a complete disk tutorial that gets you going immediately — because, after all, who wants to wait? There's also a 90-minute audio cassette from the Lotus Personal Training System that puts it all in per- spective. Just pop in the tape and you'll be on your way

to transforming your Windows desktop into an awesome productivity powerhouse.

NEC's IRONCLAD, ON-SITE WARRANTY

The best in the business is backed by a rock-solid guarantee. ONE YEAR, on-site service by fully-trained NEC technologies, Total Service Sites or factory autho- rized maintenance companies. When you receive your PC, you'll get an 800-number to call if you have the slightest problem.

HERE'S WHAT YOU GET

PowerMate 486SX/25i — includes 120MB Hard Drive and 4MB RAM	$2149.00 value
Windows 3.1	149.95 value
DOS 5.0 with Logitech Mouse	99.95 value
Lotus Smart Suite including	
1-2-3 Windows V1.1	595.00 value
Ami Pro 3.0	495.00 value
Freelance Windows	495.00 value
cc:Mail	295.00 value
Organizer Windows	199.00 value
Norton Desktop For Windows including Norton Desktop, Norton Backup and Norton AntiVirus	149.00 value
Wind•Ease 3.1	29.95 value
TOTAL RETAIL VALUE	**$4656.85**

TIGER SPECIAL — JUST $2295.00

Complete NEC Business Bundles

BCT4757 **PowerMate 486SX/25i Bundle** **$2,295.00**
BCT4758 **PowerMate 486/33i Bundle** **$2,599.00**
BCT4759 **PowerMate 486/50i Bundle** **$2,895.00**

UPGRADES & OPTIONS

BCT4779 **Add 4MB RAM** for 8MB total **$299.00**
BCT4780 **Add 8MB RAM** for 12MB total **$599.00**
BCT4781 **Substitute 240MB Drive** instead of 120MB Drive included in Bundle **$200.00**

Monitor is not included in Bundle. Please call for available monitors. Lotus Organizer does not ship till Fall. You will receive a free coupon redeemable for the full Organizer package and Installation/ Optimization disk.

all Our PC Specialists: **1-800-395-8443** Int'l Orders: 305-443-8212

Call Tiger for details on extended service warranty.

Circle 214 on reader service card

THE NEW 16 MILLION COLOR HAND SCANNER

REVIEWER'S NOTEBOOK: *This amazing device makes its world premiere on these pages. TigerSoftware has been granted the first-ever commercial shipment of the new ScanMan Color hand scanners. It's an awesome instrument, loaded with breakthrough technology and sporting a sleek, designer look.*

Logitech ScanMan Color explodes with true 24-bit technology. In fact, it scans and displays all 16.8 million colors that the human eye can see. No dithering, no banding — ScanMan Color captures breathtaking, photographic-quality color down to the tiniest detail. Express your ideas and creativity on an entirely new level...

Two great new color-scanning milestones: first, the Logitech™ AutoStitch feature — it seamlessly merges multiple scans together to create large images. Nothing else can do this, and you can scan photos and illustrations in separate passes and AutoStitch "splices" them together. Perfectly. And the Logitech hand-scanners are the only ones with AutoStitch. The second breakthrough concept is in an advanced new fluorescent light source. It requires no warm-up time, doesn't overheat and produces a more consistent white light.

ScanMan Color scanner includes FotoTouch Color Image Editing software that offers a toolbox-full of enhancement tools and special effects. Manipulate scans to produce incredible images with paint and draw features. FotoTouch also includes AutoStop, a speed warning during the scan, auto-deskewing and monitor/printer calibration. Colors can be precisely matched on-screen to printed samples.

This is an amazing new device.

NEW COLORWORKS!
$495 Value — Free From Tiger

New ColorWorks provides over 450 creative tools at your fingertips. It's a new world of image editing, with dozens of never-seen special effects.

SCANMAN COLOR

BCT5288 **ScanMan Color** . . . **$649.90**
Includes Dual Media Diskettes.

LOGITECH MICE

TrackMan. The TrackMan Stationary Mouse gives you the precision of a mouse, but stays still on your desk. Logitech designed TrackMan so your fingers rest comfortably on the buttons and your thumb easily controls the ball. This advanced design features an ergonomic shape which is angled to fit your hand for hours of extra comfort and productivity.

TrackMan Portable. Whether you're on the road or in the office, TrackMan Portable puts Logitech power and convenience in a format that's ideal for portable systems. It attaches to either side of a portable keyboard and is comfortable with either hand.

MouseMan. MouseMan is not just another mouse. Designed with nearly a decade of mouse experience and the feedback of ten million users worldwide, Logitech's MouseMan is the next step in mouse evolution. In right-and left-handed versions, MouseMan provides maximum comfort, reliability and power.

Kidz Mouse. Fun and smart, Kidz Mouse puts children in touch with their computer so they can learn educational
grams, do their homework and
games. Kidz Mouse is designed spe
cally for children.

The Cordless Mouse. The only prob
with this new innovation from Logi
is that you'll have to get used to
POINTING IT AT YOUR MONIT
The MouseMan is a cordless, th
button, radio-controlled mouse! No
bles, no line-of-sight positioning!

ALSO AVAILABLE
FIRST MOUSE

LOGITECH MICE

BCT2588 **TrackMan Combo** . . . **$89.**
BCT2591 **TrackMan Portable** . . . . . **$99.**
BCT2595 **MouseMan (Cordless Mouse)** . . . . . **$99.**
BCT2596 **MouseMan for Serial & PS/2** . . . . . **$69.**
BCT2589 **Kidz Mouse** . . . . . **$49.**
BCT2587 **First Mouse** . . . . . **$49.**

INSTANT DIGITAL SNAPSHOTS!

Introducing The Incredible New Logitech FotoMan...

REVIEWER'S NOTEBOOK: *What is it? In short, it's a portable, digital camera — for your computer. FotoMan takes great pictures with amazing clarity and 256 grayscale richness — then allows you to instantly download them to your PC. It includes a slew of image editing tools that open a world of creative opportunity, and is compatible with virtually all desktop publishing programs. The applications for this new technology are enormous. Insurance and real estate professionals are using it to expedite claims and transmit photographs of neighborhoods and homes. Manufacturers use FotoMan to quickly catalog products and parts, while law enforcement officials are using it to photograph suspects, crime scenes and evidence — without the time and expense of film.*

There are hundreds of practical uses for this new product, but we found FotoMan was also a lot of fun. It comes with an automatic flash, one-button operation and a field of focus from three feet to infinity. FotoTouch provides a sophisticated range of features including 256 grayscale editing. It's one of the hottest new ideas in computing: the digital photograph — taken by a small, portable and easy-to-use camera that allows instant transfer to your computer — without a digitizing board or other hardware.

In the past, getting a photograph into your PC meant using a traditional film method. The film would first be processed into either slides or prints, then scanned or stripped into your document. Now just snap a photo of a new employee, for example, and send it directly to the corporate database. Once the images are downloaded, FotoTouch shows you miniature versions so you can choose the image you want. When you've got your shot on-screen, the FotoTouch software allows you to easily make modifications. Then save your image in either TIFF, CCIT, BMP, PCX or EPS format. There's no film, no developing and no waiting!

LOGITECH FOTOMAN

BCT2592 **FotoMan** **$629.00**
Please call for system requirements.

The World's Best Hand Scanner

When we first introduced the ScanMan Model 256 Grayscale hand scanner last year, it met with a roar of enthusiasm. We published the results of our testing — unbelievably sharp scans, with crisp, rich detail and 256 levels of gray. Scanning photos, illustrations — and text — was instantly taken to a new level. In head to head testing, we found the Logitech ScanMan Model 256 to be more versatile, faster and capable of producing large crystal-clear images. The 256 levels of gray add more depth and realism to all your scanned images. Logitech had created the ultimate hand scanner, the hottest new product of the year.

But when you work with Logitech, you come to understand that they never sit still. While the ScanMan Model 256 was sweeping the industry (*PC Magazine's* "Editor's Choice," *InfoWorld's* 1991 "Product of the Year," *PC Computing's* "Most Valuable Product of 1991"), they were at work designing an enhancement that would catapult it to another level entirely
completely new category of scann
The innovation: Virtual Page S
ning. The Technology: the Logi
Autostitching feature. It autom
cally "stitches" 2, 3, — even 4 s
together (so it can handle more
than an 8.5 by 11 flatbed scanner!)
other scanner we've ever seen can
tomatically merge scans into one
pletely seamless image. The Scanl
Model 256 smooths and de-skews
stitch, while evening the tones ac
the scans for remarkable images.

Clean OCR Scans...

Here's where the advanced t
nology of ScanMan 256 shows w
else it can do. In our OCR test
ScanMan 256 produced usable
with fewer errors — scanning faster than any other hand or full-page scanner.

INCLUDES PERCEIVE PERSONAL OCR SOFTWARE
(A $99 Value)

Now Just $349

LOGITECH SCANMA

BCT2593 **ScanMan Model 256 with Perceive** . . . . . **$349.**
Please call for system requirements.

Circle 214 on reader service card

Now Every Windows User Can Have A Fax Machine!

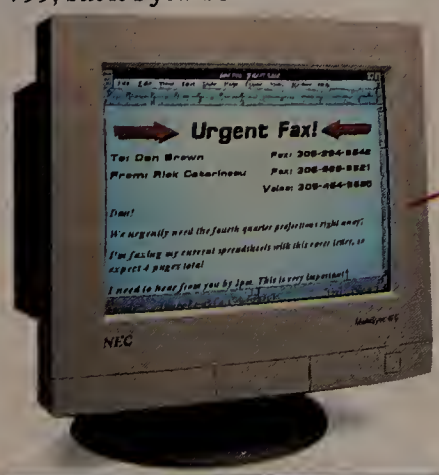
IEWER'S NOTEBOOK: *There's ing to stop you anymore! Now every dows user can put the power of a fax hine and data modem in their PC. om, makers of the award winning 96, has dropped the bottom out of prices to bring you this affordable, r-packed combo. Send faxes as as printing. Receive faxes silently in background. Transfer files between tin boards and other offices with the -in data modem. It's all easy and af- able with the new WINbest fax/data em from Frecom.*

hy should you buy WIN*best* instead of a dedicated fax machine? *best* is faster, because it doesn't to scan documents before trans- ing. WIN*best* is much, much less ensive. Why should you pay for an a printer (built into a fax machine), n you already have a printer at- ed to your computer? And no d-alone fax machine can match high quality. WIN*best*'s concept of unless" document imaging elimi- es dust, dirt and transmission ise" that shows up as dots, lines patterns on the finished fax.

With Windows, faxing from your puter is easier than any stand- e fax machine. Amazingly easy. All do is select "Send Fax" from any dows' file menu.

The quality of faxes created with Windows applications is stunning. All Adobe, Bitstream and other scalable fonts plus graphics are supported.

Everything you need for complete and easy operation is included with the 9600 send/4800 receive WIN*best* modem. The Fax Window 3.0 is packed with powerful faxing features. To handle all your data communication needs, Comit for Windows is bundled free with every WIN*best*. This robust application normally sells for $99, but it's yours free!



WIN*best* Fax/Data Modem

BCT4702 **WIN*best* Internal Fax Modem** **$99.95**

The Only Windows Fax Software That Can Do This...

REVIEWER'S NOTEBOOK: *Frecom has just overcome a major Windows problem and released a stellar technical breakthrough. The problem was that Windows only allowed one application to use a COM port at one time. You couldn't run both a modem, like Windows Terminal, and fax software at the same time. You couldn't have both fax and communications software running for automatic background receiving. Windows would simply give you an error message. You had to close one application to run the other. And intelligent receiving with automatic switching between fax and modem was totally out of the question.*

Now you can open fax software, communication software and remote control software all at the same time with the new ComPort Manager from Frecom. When a fax comes in, it automatically goes to your fax software. When a data modem call comes in, it automatically goes to your communications software. Call in to remotely operate your computer and still be able to receive faxes or data when you disconnect. This brand new breakthrough is only available from Frecom.

Frecom — the only fax modem manufacturer who also designs and creates its own fax software — has just released their award-winning Fax Window 3.0 software for sale separately. With over 3 years of fax experience, this phenomenal software package has features and benefits no other fax software can touch.

Automatic background receiving, sending as easy as printing, fax merge features way ahead of the competition — it's all yours with Fax Window 3.0

Unattended, intelligent operation in the background automatically routes faxes to the Fax Window and data calls to Comit for Windows. Not just for fax and data traffic, ComPort Manager also works for remote control software like PC Anywhere.

FAX WINDOW 3.0

BCT6239 **Fax Window 3.0** **$79.95**

Instantly Turn Any PC Into A Fax Machine!

IEWER'S NOTEBOOK: *Your PC is the perfect fax hine: it easily creates documents to fax, it has pow- l printing capabilities and contains plenty of storage ce. It allows you to automatically transmit faxes at a ain time. You can send crisp, clean facsimile docu- nts right from your desktop or laptop PC. With Faxo- bhy, included free with all Fax96 products, you can documents from virtually any DOS application with 3 different fonts, graphics, special effects l more. Fax96 automatically previews the ument on the screen so that you are faxing file just as you would print it. Of course, ng your PC makes it much easier to manage l archive your faxed communications. And, ng your laser or dot-matrix printer, you can eive faxes ON PLAIN PAPER. All you need he compact, affordable little board you see e, known as Fax96.*

iger presents the price-busting fax board that has swept the industry, and captured *PC MAGINE's* "Editor's Choice" with its flawless reliabil- record. No other fax board can match Fax96's redible 99.91% error-free transmission rating. In ed tests, using identical documents, Fax96 deliv- d a finished facsimile over fourteen seconds ahead he nearest finisher.

Loads of Special Features...

The list of features that Fax96 gives you goes on d on. Automatic transmittal cover-sheet genera- n with enough "comments" lines to be a short fax by itself. Automatic redial in case the called num- r is busy. An automatic log of sent and received es. Printing compatibility with lasers and dot- trix printers. And perhaps best of all, familiar ush button" fax machine feel.

Fax96 With Powerful Modem.

Add a high-powered, 2400 bps data modem to the 9600 send/receive Fax96 for a dynamite PC communications combo. If you're short on slots or COM ports, this is a must. Both fax and modem fit on one half-size board. The Fax96 with Modem also supports **full background send** and **receive.**

The 1-Liner Advantage.

Ever been on the road wondering "did I get that fax yet?" You need the FarFetchFax™ feature. Phone home and pick up your faxes as easily as picking up answering machine messages. In fact, do both at once. Listen to your phone messages, then enter your FarFetchFax code and tell Fax96 where to forward your faxes. That's unique. And every 1-Liner model has it. Receive faxes and voice calls on one phone line even when you aren't there. The 1-Liner is a built-in voice/fax switch on the Fax96 fax board.

9600 & 14,400 Winfast Series

Introducing the highest speed modem available — 14,400 bits per second. Wow! They don't get any faster than this. The Winfast 9600 bps fax/data modem fits the current standard for high-speed communications. All the latest technology is here. 100% Hayes compatible. Numerous compression techniques, like V.42bis that delivers up to 4:1 compression, meaning your data gets transferred 4 times faster — up to a screaming 57,600 bps! All Winfast modems for Windows include Fax Window 3.0 with ComPort Manager.

The Fax96 FAX Modems

BCT6255 **Fax96 With Modem & 1-Liner And DOS Software** **$149.95**
BCT6256 **Fax96 With Modem & 1-Liner And Windows Software** **$199.95**

Winfast Fax And Data Modems For Windows

Winfast 9600 Fax Modem

BCT6264 **Internal Model** **$309.95**
BCT4746 **External Model** **$349.95**

Winfast 9600 Fax Modem With One Liner Option

BCT6263 **Internal Model** **$359.95**
BCT4745 **External Model** **$419.95**

Winfast 14,400 Fax Modem

BCT6262 **Internal Model** **$419.95**
BCT4744 **External Model** **$449.95**

Winfast 14,400 Fax Modem With One Liner Option

BCT6261 **Internal Model** **$429.95**
BCT4743 **External Model** **$459.95**

Requires IBM PC/XT/AT or compatible, 640K memory and hard disk.

Circle 214 on reader service card

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M-F 8am-Midnight, Sat. 8:30am-8pm & Sun. 11am-5pm (EST)

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Yes! You Can Set Up Your Own Databases!

Simpler Than dBase & Paradox, More Powerful Than Q&A!

REVIEWER'S NOTEBOOK: *Alpha FOUR has been a runaway best-seller since its introduction, allowing anyone to fully automate and computerize invoices, inventory systems, sales prospecting systems, customer lists and more. The reason is simple: Alpha FOUR requires NO programming. In just a few hours, you can create professional databases, customized to fit your needs.*

Alpha FOUR is the only database we've found that can be used right out of the box, without the tedious training time needed for the others. It runs from DOS, so you know it runs on any computer — lightning fast. But that's only the beginning...

The new Version 2.0 is packed with all the latest advanced features like network capability and 5 times the speed of the previous award-winning version. You really can do it yourself with this fantastic database and application development system!

That Monday morning I was ecstatic with anticipation. I work for a real estate office in FL. Just the night before I put the finishing touches on my new application, and it was time to call in the boss and my three realty agents to unveil my new creation. It was beautiful. A major step in handling our number one problem: disorganization causing us to lose prospects and valuable time.

*Talk about ease-of-use combined with **power** — I can relate 3 database files together for my Invoicing application. Alpha FOUR gives me what I need for serious applications.*

At first they were skeptical. You see, I've tried other programs with them before, none of which were very impressive. But this time I was confident. I knew I had something to knock their socks off. They saw the colorful, easy-to-follow menus I had created. Their enthusiasm grew as they realized this could really help them. At the end, their applause was overwhelming as they congratulated me on my stroke of genius. (Of course, I didn't tell them how easy it was with Alpha FOUR.)

Here at Sunshine Realty we work hard to get new prospects. We're good at it. But our rate of turning prospects into customers was below average. We always had trouble keeping track of them and following up at the right time. I had to do something to stop this waste of valuable leads. So I decided to computerize.

With Alpha FOUR I can create custom applications in a fraction of the time I spend with other programs. It's the fastest, easiest database program I've ever seen.

A programmer friend of mine told me to buy dBase and create a database. So I did. Or at least I tried. It was a bomb. After a full week of trying to figure it out, I still couldn't create a simple menu for my new application. I just didn't know what to do. And the huge manuals were no help. Finally, I gave up.

I tried buying off-the-shelf Contact Management software packages, but they were no good. They all seemed to have a trillion things I didn't need which just cluttered up the screen. My agents wouldn't even attempt to use them because they looked like more work than they were worth.

Then I read about this new database for non-programmers like me: Alpha FOUR. It has all the power of dBase, but without any programming experience needed. So I gave it a try. Wow! Was I amazed! Within hours, I was busy creating a professional application that does exactly what I need it to do.

My Prospect Tracking application has beautiful screens that were incredibly easy to make. Using Alpha FOUR's Screen Painter, I simply drew a picture of what I wanted. Fields for the prospect's name, phone, lead source, follow-up date, even a memo field that's like a mini word processor for notes is all there. A colorful border and helpful instructions right on-screen tell my agents what to do. It's all so easy. I don't have to tell them anything. They merely follow along and reap the benefits of our own fully-customized, automated system.

I Set Up My Own Database In Minutes.

First, I needed a system of menus and sub-menus. Was I ever surprised to see how easy that was! With Alpha FOUR's "Application Editor" I wrote an outline of my menus and sub-menus. Alpha FOUR automatically created my multi-level menus right from there. Changing my menus was just as easy.

Forms and Reports.

Alpha FOUR's Report Writer was even more impressive. I "painted" reports on-screen. They looked exactly like I wanted them to — much better than our old paper forms. This "What You See Is What You Get" approach to report writing gives me the flexibility I need to create meaningful and detailed reports.

Totally dBASE Compatible.

I was delighted to hear Alpha FOUR is totally compatible with dBASE .dbf files. Our mailing list went right into the new application without even having to be converted! And when my Alpha FOUR application grows, it'll import those Lotus 1-2-3 files used over in accounting. In fact, Alpha FOUR can import and export Lotus 1-2-3, Symphony, VisiCalc, PFS, MultiMate, WordPerfect.

And Now I Get Fancy...

First I'll change my menus to 3D boxes for the menu selections, and change some of the colors here and there. Alpha FOUR makes it all so easy. Then I'll customize some of the data entry screens so they look just like the paper forms the employees are used to working with. I know — I'll call up Alpha's free Bulletin Board Service and get some tips from other Alpha FOUR users.

- 128 Fields Per Record
- 256 Characters Per Field
- 4,000 Characters Per Record
- Unlimited Records Per Database
- Field Types: Character, Numeric, Date, and Logical
- Variable Length Memo Fields, up to 5,000 Characters
- More than 80 Data Manipulation Functions

With menu-driven ease, I create applications with Alpha FOUR that before I never thought possible. I don't need to be a programmer — I only need to know what I want to create. Alpha FOUR takes care of the rest. I look for things to organize and put on the computer. I don't need a programmer. I do it myself.

Version 2 takes ease-of-use to a new level by allowing more productivity with less work. Fully Novell and Net-

PC / COMPUTING Best Value

PCWEEK Rated #1

★★★½ Home Office Computing — September 1992

PC Magazine Editors' Choice

PC World Best Buy

The PC/Computing 200 Best PC Products 1992

DBMS 1991 Readers' Choice

InfoWorld Excellent Value

Awarded for Version 1.1 — *PC Week*, May 14, 1990; *InfoWorld*, May 22, 1989; *PC Magazine*, December 17, 19 *DBMS*, December 1991; *PC World*, March 1990.

Awarded for Version 2.0 — *PC Computing*, June and Aug 1992; *Home Office Computing*, September 1992.

Bios compatible (including LANtastic, MainLan, L Manager, Banyan and others), Alpha FOUR Versio allows you to actually create networkable applicati by filling in one simple screen! All file and record lock procedures are handled for you — automatically. Al FOUR Version 2 makes it so simple.

HERE'S WHAT YOU GET

Alpha FOUR (Single User) . . .	reg. price $495.
Personal Lawyer	reg. price $49.
Corporate Ladder	reg. price $79.
Dollars & Sense	reg. price $99.
Zip Code Database	reg. price $49.
Total Value	**$774.8**

ALL FOR JUST $99.90

ASK ABOUT
THE ALPHA FOUR SERVER UNI
You Get TWO Extra Network LAN Packs Inside Absolutely FREE! *($1047 Value).*

Alpha FOUR Version 2

COMPETITIVE UPGRADE

BCT3458-3 **Alpha FOUR Version 2 Non-Networkable** 3½" **$99.9**
BCT3458-5 **Alpha FOUR Version 2 Non-Networkable** 5¼" **$99.9**

NETWORK VERSION

BCT3459 **Alpha FOUR Version 2 Network Pack** Includes Network Server and 2 Network LAN Packs **$399.9**

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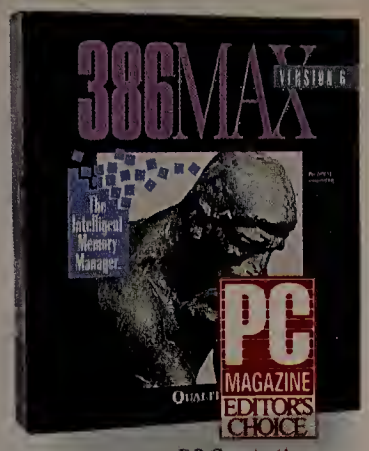
The Intelligent Memory Manager

emory managers have become a vi- necessity in every puter. Programs, works and hardware ers daily grow er and larger — de- ring your limited nory. Viruses gue the industry. To- you need protection stantly in the back- und. These reasons more demand a nory manager.



PC Computing, December, 1991

A memory manager lets you have us protection, networks, hardware ers and more constantly available without any sacrifices. Without a nory manager, you wouldn't have ugh memory left to start the sim- st of programs.

New 386MAX 6 maximizes sys- t performance more easily, com- ely and automatically than any er memory manager you can buy.

A fact documented by many lead- editors of today's top PC publica- ns. All of whom rate 386MAX 6 the choice in memory management.

386MAX does a superior job of luating every aspect of your sys- t. Recovering as much high DOS as sible. Then using its advanced new mory management tools — like Msearch, VGAswap, and Maxi- ze Reordering — to optimize and configure your system for maximum usable memory. And maximum performance.

And if you thought Windows and DOS 5 were good at handling memory, try teaming them up with 386MAX. You'll have the ultimate memory management solution. With better all-around performance than you'll get from either one alone. Or with both.

"Our top-scoring memory manager is Qualitas' 386MAX Version 6.0."
InfoWorld, 12/9/91

"Get Windows' EMM386.SYS off your disk and put MAX to work."
Jim Seymour, PC Week
"Now for the Best 'Little' Products of 1991" 12/23/91

386MAX 6.0

BCT3079-3 **386MAX 6.0 Upgrade $39.95**
BCT3079-5 **386MAX 6.0 Upgrade $39.95**
Requires 386 or 486 based computer, minimum 256K extended memory, PC/MS DOS 3.0 or later. Supports LIM 4.0 EMS, XMS 3.0, VCPI and Virtual DMA Services 1.0.

QEMM owners must supply serial number when ordering to receive $39.95 price.

NEW AMI PRO 3.0

REVIEWER'S NOTEBOOK: *When we first saw Ami Pro 2.0, the older version, we were convinced that it was the best word processor for Windows. Its SmartIcons, crisp WYSIWYG display, easy-to-use interface and sleek functionality made it the most useful word processor in the industry. The way it so gracefully harnessed the power of Windows meant anyone could use it to create professional quality documents.*

Frankly, there wasn't much room for improvement — or so we thought.

Lotus proved us wrong. They went back to work on Ami Pro and came up with one of the most spectacular upgrades we've seen. This ground breaking new version not only improves on the preceding release, it sets Ami Pro 3.0 so far ahead of the competition that it isn't even funny.

Ami Pro 3.0 has improved on the fundamentals, so you'll do more in less time. In fact, we created a page in 2.0, then created the same page in new 3.0. The result? New Ami Pro 3.0 produced the same page in less than half the time. The new Drag-And-Drop editing is the main time-saver, enabling you to just highlight and click to move things around, add elements to your documents and make revisions.

Another great leap: mail merge. It's simple. If you've shied away from mail merge because you thought it was too difficult. It probably was. But it's streamlined in Ami Pro 3.0 with a host of intuitive options. Envelope printing is a cinch, too — Ami Pro 3.0 actually searches through your letter to find the address!

NEW AMI PRO

BCT5294 **Ami Pro 3.0 Upgrade** 3½" or 5¼" For Ami Pro Users **$79.00**
BCT5293 **Ami Pro 3.0 Competitive Upgrade Dual Media** For Current Users Of Any Other Word Processor **$99.00**
BCT5089 **Ami Pro 3.0 Standard Dual Media** For New Users Not Upgrading From Ami or Any Other Word Processor ... **$269.00**

The Best Diskettes and Tapes Money Can Buy

VIEWER'S NOTEBOOK: *We wanted highest quality, most durable, long- lasting, best diskettes and tapes for r TigerSoftware catalog. So we opped, and compared, and tested... til we came to a unanimous conclu- n: Fuji is Number 1. Their 30 years of cellence in the recording products in- stry has led them to the forefront of mputer media technology. Their ex- nsive research and development has lminated in unique patents and de- ns that no one else has. Their dedica- n to the future has resulted in new cording media products years ahead of e competition.*

Here at Tiger we believe that storage d backup media has to be the best. cond rate just won't do. When it mes to priceless data that's irreplace- le, who could consider otherwise? hat's why we'll only sell the best, and e best is Fuji.

You're Not Sure Which To Get. Just Call!

FUJI

5.25" DISKETTES
BCT7364 **MD2HD** 10 Pack..... **$8.00**
BCT7365 **MD2HD Formatted** 10 Pack..... **$9.00**

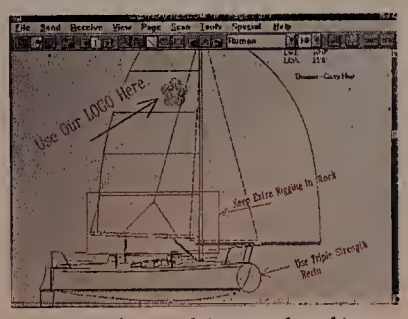
3.5" DISKETTES
BCT7366 **MF2DD** 10 Pack..... **$8.00**
BCT7367 **MF2DD Formatted** 10 Pack..... **$9.00**
BCT7368 **MF2DD Rainbow** 10 Pack. **$9.00**
BCT7369 **MF2HD** 10 Pack..... **$14.00**
BCT7370 **MF2HD Formatted** 10 Pack..... **$15.00**
BCT7371 **MF2HD Rainbow** 10 Pack **$15.00**
BCT7372 **MF2HD** 20-Pack **$26.00**
BCT7373 **MF2HD** 30-Pack **$37.00**
BCT7374 **MF2HD** 20 Pack with Backup **$27.00**
BCT7351 **MF2HD** 50-Pack **$59.00**
BCT7352 **MF2DD** 100-Pack..... **$69.00**

TAPE CARTRIDGES
BCT7354 **QG-112M 8mm** **$13.00**
BCT7355 **DG-60M 4mm** **$15.00**
BCT7356 **DG-90M 4mm** **$19.00**
BCT7357 **DC-600A ¼"** **$24.00**
BCT7358 **DC-6150 ¼"** **$26.00**
BCT7359 **DC 2000 ¼"** **$17.00**
BCT7360 **DC 2120 ¼"** **$23.00**
BCT7361 **DC 300XLP ¼"** **$22.00**
BCT7362 **DC 2080 ¼"** **$19.00**

The Finest Windows Fax Software For Your Fax Modem

REVIEWER'S NOTEBOOK: *At first glance we knew this was a winner — something brand new in the arena of advanced fax software. We could send faxes as easy as printing, receive them without a hitch in the background, view them with sparkling clarity on-screen and make any kind of changes — then send them out again without touching a printer or scanner! And the File Management system kept all our faxes perfectly organized. Finding the exact fax we needed was no problem thanks to the Search Index and sorting capabilities.*

From the multi-page, thumbnail views of received faxes to the built-in drawing tools for fax mark-ups and editing notes, we knew this was a hit.



Receive a fax, mark it up, and send it out with no loss of quality. Built-in drawing tools make it a breeze!

ECLIPSE FAX

BCT4774 **Eclipse for Windows** . **$89.90**

HOT CLIP-ART

The Logitech Modern Art Series is a library of high quality clip art collections for use with PC based desktop publishing, high end word processing and presentation graphics programs. The series consists of five collections with each collection containing a library of over 100 clip art images related through various themes. The collections are: Newsletters, Symbols and Borders; People, Places and Things; Business and Professional; Holiday and Special Occasion; Sports, Recreation, and Travel.

Pick one for $59.95 or get all 5 for $99.90.

Modern Art

BCT5005E **People, Places & Things** **$59.95**
BCT5005B **Newsletters, Symbols & Borders** **$59.95**
BCT5005A **Business & Professional** **$59.95**
BCT5005D **Sports, Recreation & Travel** **$59.95**
BCT5005C **Holiday & Special Occasion** **$59.95**
BCT5005G **ALL 5 Libraries** **$99.90**

Circle 214 on reader service card

PHOTOGRAPHS: ROBERT CARDIN

Best Choice:

486DXs *or* Upgraded 486SXs?

SO MANY DECISIONS. WHICH PROCESSOR? WHICH UPGRADE PATH? IN THIS REVIEW, WE NARROW THE FIELD BY COMPARING TWO GROUPS OF SYSTEMS WITH GREAT PRICE/PERFORMANCE: 13 NEW 33-MHZ 486DXS AND 12 CLOCK DOUBLED 25-MHZ 486SXS.

The dilemma for the PC buyer has always been whether to buy now or wait just a little longer for new machines to come out or prices to fall. Intel hoped to change all that with the introduction of the SX OverDrive chip, a plug-in CPU upgrade that runs about twice as fast as the original CPU and costs little more than $625 on the street. Now that the strategy is working and people have begun to understand it, Intel is muddying the waters by making OverDrive upgrades available for its 486DX systems too. The 33/66-MHz 486DX OverDrive processor will take some time to appear, but it will offer essentially the same technology as the SX OverDrive.

By Michael Goodwin and Owen Linderholm

ranty; the Ares, Boss, PBS, and Polywell are guaranteed for two years. The standout here—in the negative—is the FastData 486SX/25. Our *Consumer Watch* editor has been recording complaints about service and support from FastMicro, and the weight of evidence forces us to score the system extremely poorly in this regard. A pity, because by many measures it's a nice machine. If FastMicro reforms its policies, its system will be worth considering.

Your Choice—Upgrade or Upgrade

"Best Buy" means best overall value based on a combination of price, performance, service, and construction.

Of course, everyone has a different set of priorities. If your business depends on CAD or desktop publishing, you'll want the fastest system on the block. For other users, price is far more important. Service and support is crucial if your shop does not have an office services staff that knows how to keep your PCs running.

Sheer speed is the primary factor that gained the Acma 486sx/25 with OverDrive its overall top spot: It placed first in every performance benchmark except the *dBASE IV* test, where it was second. It's one of the least expensive doubled SX-25 systems, too. The next four systems ran close, but the Wyse Decision 486si used its OverDrive speed on benchmarks and a $2753 price tag to fend off three DX-33 rivals, the EPS 486-33MHz ISA, the Axik Ace Cache 486/WB-33, and the Amax 486 33/50 ISAmax Power Station. The Ace Cache consistently led the DX-33s in the performance benchmarks, and its $2398 street price was one of the lowest.

Keep in mind that the street prices of the 486SX-25/50 systems include the $629 cost of the SX OverDrive chip. You could, for example, purchase the fast Blackship 486SX-25 for $2288 on the street without the chip. Among the DX-33s, only the Twinhead Superset 600/433C costs less.

The key to choosing a system is determining how much will satisfy your needs. If your choice is between a 486SX-25 and a 386, by all means go for the 486SX-25. If an OverDriven 486SX-25 will give you all the performance you need for a few years, then take that route. If, however, you're feeling lucky (or are willing to do some careful shopping), you should look at a 486-33 that you'll be able to upgrade—either via an OverDrive chip, or with a processor-board or clock-and-CPU swap to 50 MHz.

Just be sure you put that OverDrive in your new 486SX-25. While the vanilla system saves you money on initial purchase, it's not really competitive in terms of price/performance value until you drop in that OverDrive chip.

Michael Goodwin is an associate editor, Owen Linderholm a senior editor, and TJ Byers a contributing editor for PC World.

For more information about all products in this article, circle reader service no. 904.

Is a Big Cache Always Better?

Since 386 CPUs do not include an internal memory cache, it makes perfect sense that systems based on these CPUs show impressive performance gains when an external memory cache is added. Cache memory is faster than main memory, so the CPU can read or write data without delay. But because the 486 CPU *does* feature a fast 8K internal cache, we have long wondered how much impact the size (or presence) of an external cache would have on 486 system performance.

To answer that question, we configured and tested several 486SX-25 and 486DX-33 systems with zero K, 64K, and 256K of cache. You'll find two sets of test results in the table at the right. As expected, we found a dramatic improvement between no cache and some cache—but, surprisingly, the numbers show negligible difference between a 64K cache and a 256K cache.

How can this be so? Historically, DOS and most applications that run under it (including *Windows*) have been written to access memory via a 64K memory block. This effectively removes any advantage for caches larger than 64K. The exception is *dBASE IV*. Our test showed that it ran about 10 percent faster with the larger cache. Both Intel and Borland tell us that unlike most DOS applications, the *dBASE IV* code requires just slightly more room than a 64K cache provides. We also learned from Intel that Novell's local area network may run faster with a cache bigger than 64K. Moreover, high-end operating systems such as UNIX, OS/2, and the forthcoming Windows NT that use a flat memory model should show a linear speed increase when working with a cache larger than 64K.

So what do these numbers say to you, the two-fisted DOS-and-*Windows* user? They say don't waste your money on more external cache for your 486 than you'll use—at least right now. For the moment, 64K is plenty. But if you're looking to the future, buy as big a cache as you can afford. Better to have and not need than to need and not have.

—TJ Byers

Cache Doesn't Always Get Credit

Time in seconds	ATronics ATI-486-33			Copam 486B/33		
	None	64K	256K	None	64K	256K
1-2-3 3.1	259	229	225	269	241	236
AutoCAD 10	201	170	168	200	174	171
dBASE IV 1.1	355	275	252	486	339	301
Paradox 3.5	554	488	480	546	494	487
Windows 3.0 multitasking	71	59	58	75	69	66
WordPerfect 5.1	44	40	40	45	42	42

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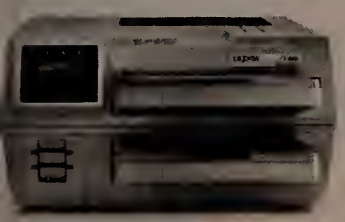

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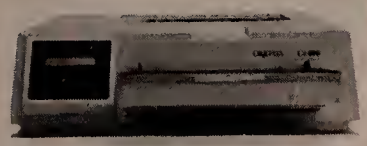

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VITAL STATISTICS
Street price: $3024
PROS: Very fast, fine service and support
CONS: No turnaround guarantee
Contact: 800/786-6888, 510/623-1212
Reader service no. 700

Acma 486sx/25

If speed is your thing, you can stop right here. Acma may not be a famous brand name, but its compact 486sx/25 (equipped, of course, with a 25/50-MHz OverDrive clock doubler) was the numero uno performer, taking first place in four out of five events: *1-2-3*, *WordPerfect*, *Paradox*, and *Windows*. More good news: Despite its diminutive case, expandability is unimpaired. You end up with five free slots and four drive bays (all externally accessible)—plus a slightly oversize (at least for this roundup) 244MB Seagate hard disk.

There's an easy upgrade path as well: You can install a new clock crystal that runs at either 33 MHz or 50 MHz. That option lets you move up to a 486DX CPU running at either speed—or, most likely, a 33/66-MHz OverDrive chip. Solid service and support starts with a year of free on-site service and includes a toll-free tech support line that works on weekends. Unfortunately, Acma does not guarantee how quickly it will turn your repair job around. Aside from that minor problem, we have no complaints. Despite its midlevel price, the Acma's stupendous performance and solid balance of features boosts it to a Best Buy finish—and one of the most impressive price/performance ratios in the roundup. In fact, when we compare overall value, Acma takes the highest rating by a hair.

VITAL STATISTICS
Street price: $3801
PROS: Very fast, CPU-board upgrade, good service and support
CONS: Expensive, few slots and bays
Contact: 800/444-4257
Reader service no. 701

ALR Flyer 32DT 4SX/25

ALR's Flyer 32DT 4SX/25 is a serious speedster—at least when clock doubled to 50 MHz. It was the third-fastest system in this entire roundup, placing first on our *dBASE* benchmark, second in *1-2-3*, and third on *WordPerfect* and *Windows*. It also boasts an easy upgrade path: The CPU resides on a processor board, so you can replace the board with another processor board that holds a 33-MHz 486DX—and probably upgrade *that* with a 33/66 OverDrive chip. Service and support is solid: On-site service is virtually free, and the tech support line is toll free and works weekends. Answers were accurate, even if we had to wait a bit to speak to a technician.

The Flyer came with a large, 256K external cache, which helps explain its great *dBASE* test score. The supplied hard drive, a 200MB Maxtor, is merely standard. Integrated video shows how tight the design of this compact desktop system is and also helps explain the ALR's good finish in our *Windows* test.

The rest of the tale isn't so upbeat. The compact case limits you to a stingy three free expansion slots and three drive bays, only two of which are accessible from the outside. That means you can forget about having two floppy drives and a tape backup. Worst of all is the Flyer's price: $3801 might have been a good deal for a machine like this a few months ago, but not today. The price and limited expansion options drop it to third from last in overall value.

ALR made some recent price cuts in response to those made by Compaq. The full effect of the cuts probably has yet to make it down all the way through the dealer channel, so you can expect to see this poor price improve. Nevertheless, you can do better.

VITAL STATISTICS
Street price: $2661
PROS: Good price, fine service and support, plenty of slots and bays
CONS: Seven-day turnaround
Contact: 800/888-2629
Reader service no. 702

Amax 486 33/50 ISAmax Power Station

A single outstanding feature seldom makes a winning machine. More often a balanced package of excellence wins the day, and such is the case with the 33-MHz ISAmax Power Station. This big white tower is reasonably priced, and while it can't keep up with the clock doubled 25/50s, it's still pretty fast: It placed sixth in *Paradox*—not bad for a lowly 33. You get a Diamond SpeedStar VGA board, and the tower case provides five free slots (if you use the 32-bit memory slot for an ordinary 8-bit board) and eight bays.

The ISAmax Power Station comes with a Quantum 240AT 244MB hard drive. This fast drive helped the Amax pull out its good scores on our *dBASE* and *Paradox* tests, where it finished ahead of the other 486DX-33s and not far behind the fastest OverDriven 486SX-25s. Not only that, but Amax offers storage expansion options for this system mass of up to 2.1GB—more than most other systems in the review.

Amax has put some thought into making this system easy to use: All the ports are labeled, and the cables are neatly dressed. At the moment, you have only one guaranteed CPU upgrade option: Drop in a 50-MHz clock crystal and a DX-50 CPU. But in all likelihood a 33/66 clock doubler chip will work too. With the exception of a

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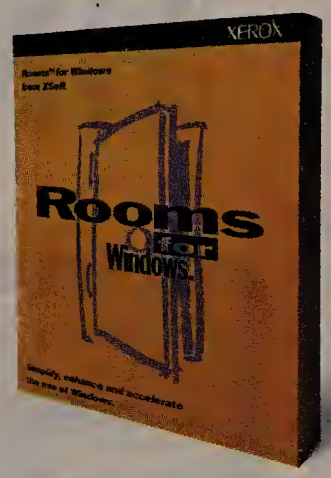

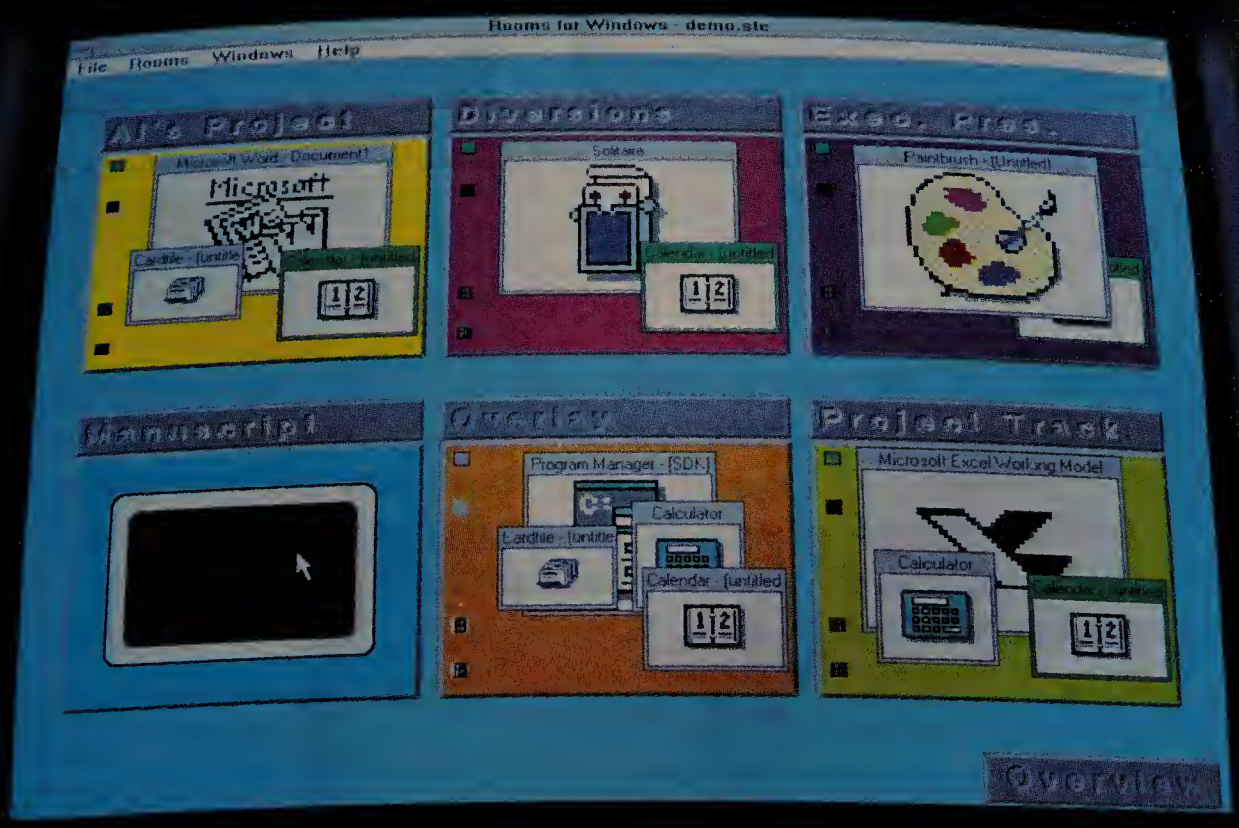

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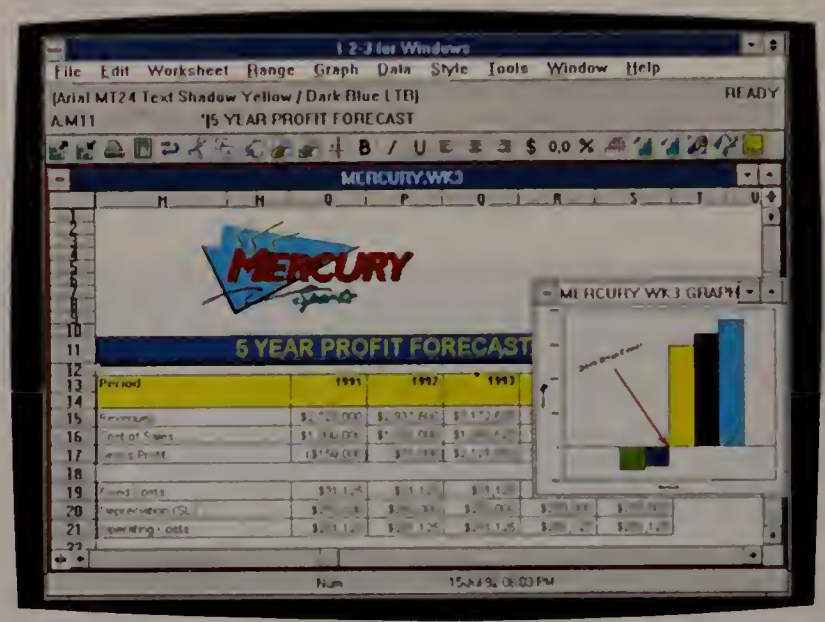

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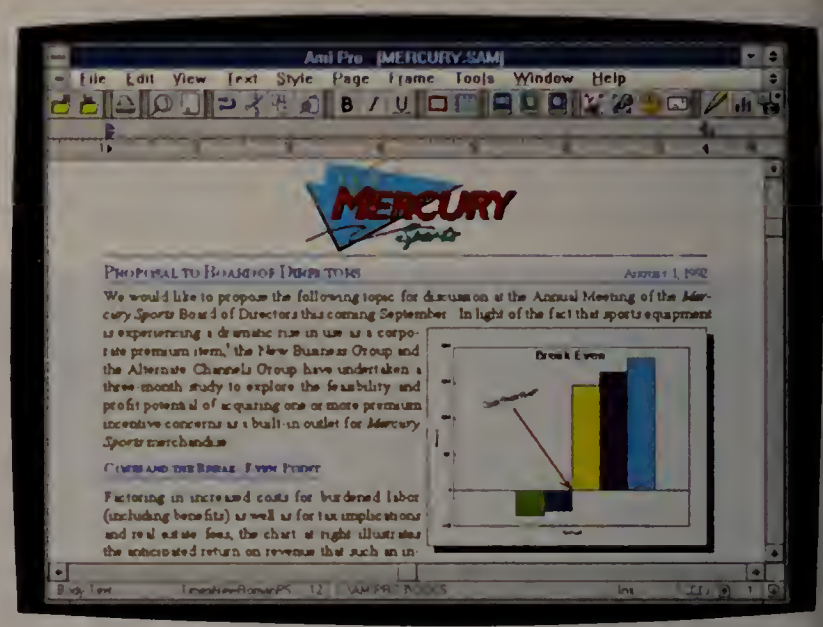

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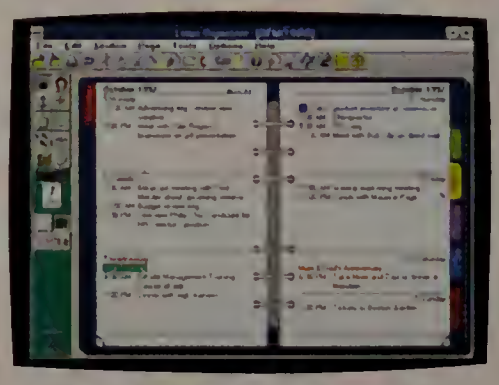

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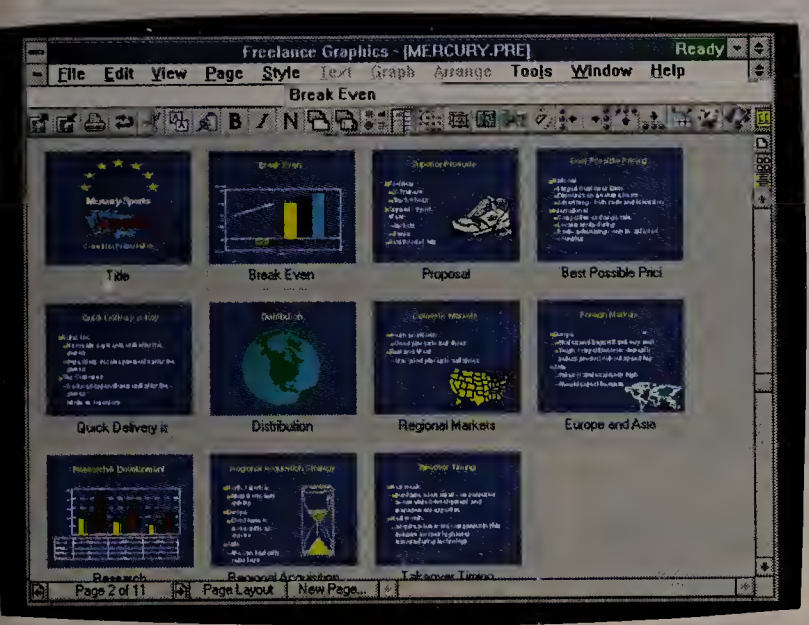

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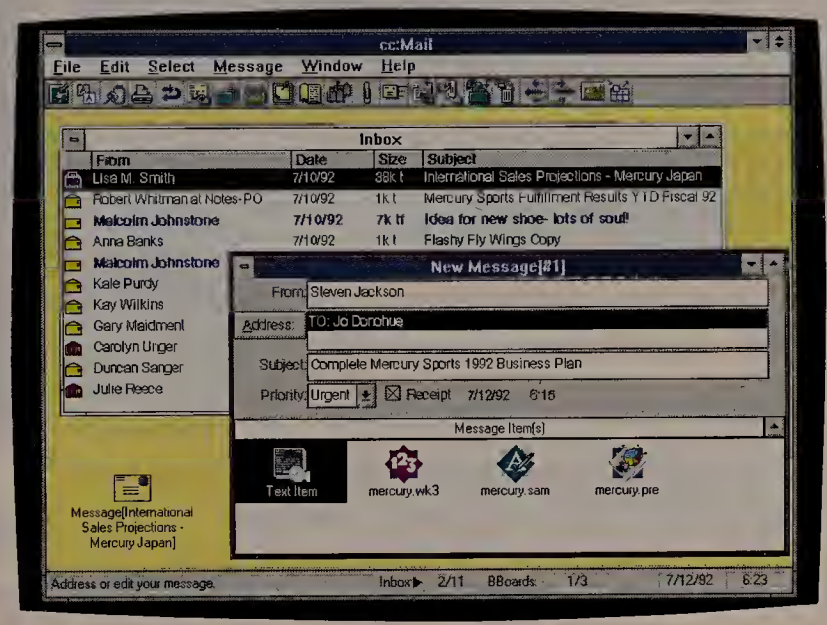

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Lotus SmartSuite for Windows

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seven-day turnaround guarantee (which is so slow it's hardly worth mentioning), Amax's service and support is among the best here. A year of on-site service costs only $69; the toll-free tech support line works on weekends; and we got fast, accurate, useful answers every time we called. While this isn't one of today's fastest systems, it has tremendous potential for the near future.

VITAL STATISTICS

Street price: $3000
PROS: Two-year warranty, upgradable CPU board
CONS: Spotty tech support
Contact: 800/322-3200, 313/473-0808
Reader service no. 703

Ares 486-33 Sonic III

This 33-MHz system is no speed demon, but it has a lot to recommend it, including a top-of-the-line Sonic Spectrum video board with an S3 graphics accelerator, and a respectable price/performance ratio. The full-size case holds plenty of drive bays and five free slots, but one of the 8/16-bit slots accommodates only a half-length board. Because the CPU is mounted on a processor board, it makes upgrading to 50 MHz as easy as sliding in a new board—or if you prefer, you can wait for Intel's 33/66-MHz OverDrive chip. The Ares Sonic III's fast hard drive explains its good scores on our data base tests with *dBASE* and *Paradox*. The external cache on this system can be expanded to a huge 512K. Service and support is mostly excellent: The Ares Sonic III's support package provides a generous two-year warranty, a three-day turnaround guarantee, and a toll-free tech support line 24 hours a day, seven days a week. But the company's tech support lost points because accuracy and response speed were both patchy. Bottom line? You can do better, but you can also do a lot worse.

VITAL STATISTICS

Street price: $2495
PROS: Good service and support, inexpensive
CONS: Slow
Contact: 800/488-7776, 510/656-8400
Reader service no. 704

ATronics ATI-486-33

ATronics' ATI is a low-priced tower with a lot going for it—everything except speed. Of course, in a world where everything is relative, you have to remember that even a "slow" 486/33 *flies*, and the ATI isn't that slow. However, it just doesn't turn in dazzling performance numbers. Expandability is good, as you would expect with a tower case: There are nine drive bays and five free slots. If you want to correct the speed problem with a CPU upgrade and don't mind spending some dough, you can buy a 50-MHz crystal and a 50-MHz 486DX CPU from ATronics and install them yourself. Or you'll probably be able to use a 33/66-MHz OverDrive when it hits the market. Despite a Diamond Stealth VRAM video board, the Atronics ATI-486-33 got only average scores on our *Windows* test and didn't do any better on the other tests.

ATronics' service-and-support package includes three-day repair turnaround and a toll-free tech support number. When we called it, we got fast, accurate answers. On-site service is a bit pricey, though: $100 a year. You can find a better value by choosing one of our Best Buys, but this is still a good system.

VITAL STATISTICS

Street price: $2398
PROS: Great price, excellent expandability, good service and support, ZIF socket
CONS: None
Contact: 800/234-2945
Reader service no. 705

Axik Ace Cache 486/WB-33

Axik may not be a household name, but its Ace Cache system is one of the best PCs we examined. For starters, it's the fastest 33 we tested. It placed fifth on *Paradox*, acing quite a few OverDriven 25/50s in the process. Good scores on our *WordPerfect* and *dBASE* tests also helped the Axik Ace Cache achieve its great finish.

Nor does the good news end there: $2398 is one of the lowest prices we turned up—and it includes a Diamond Stealth VRAM video board with an S3 graphics accelerator and a large 234MB Quantum hard drive. Also, the tower case means you'll never have to worry about expansion capacity: It has six free slots and eight drive bays. Axik offers hard drive upgrades all the way to 1.7GB, a great plus for a system with lots of expansion capacity like this one.

Fast as it is, in most applications the Ace Cache can't keep up with an OverDriven 25/50. Happily, upgrading this system is a snap. You can try Intel's 33/66 OverDrive chip when it comes out, or jumper the clock to 50 MHz and drop in a 486DX-50. Either way, installing a new CPU is as easy as lifting a lever, thanks to the ZIF socket.

Service and support is another big plus. Although you pay for on-site service after the first year, you get a one-year warranty, a guaranteed two-day turnaround on repairs, and a toll-free tech support line that works even on weekends. When we called, we got through quickly, and the answers were reasonably accurate. Every company starts small. And one of the ways a small company achieves the kind of universal recognition that firms like Dell and Compaq enjoy is by making a solid product at a fair price. If Axik keeps up the good work, household-name status could be just around the corner.

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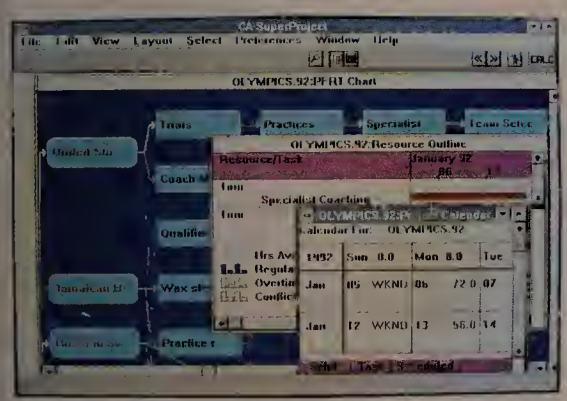

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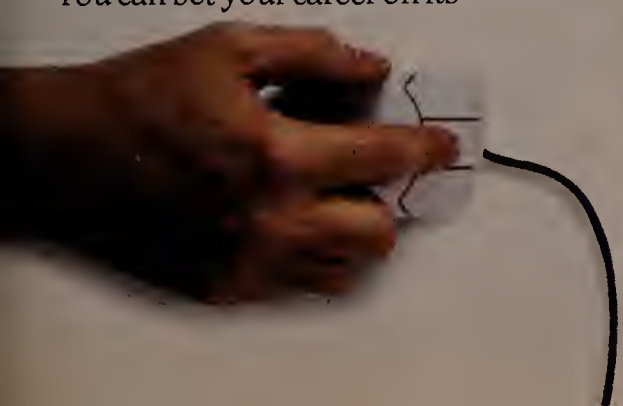

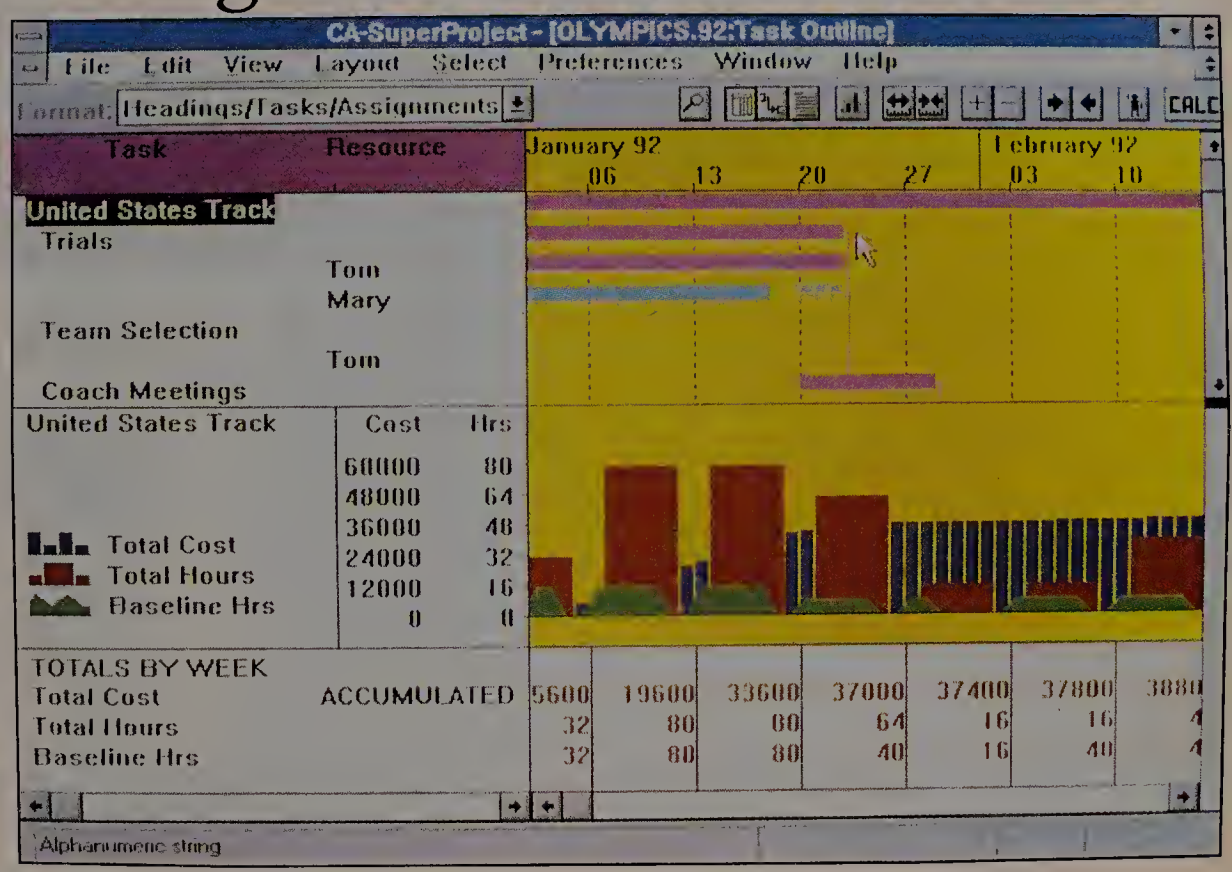

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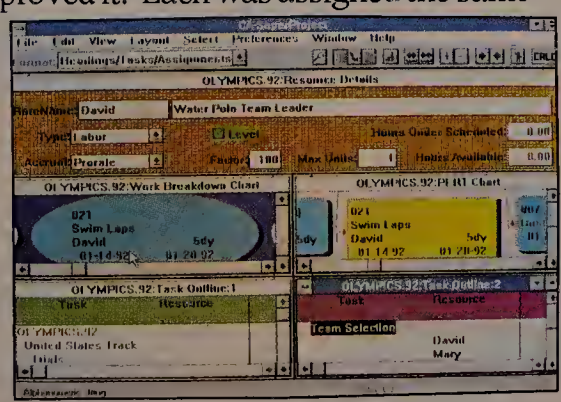

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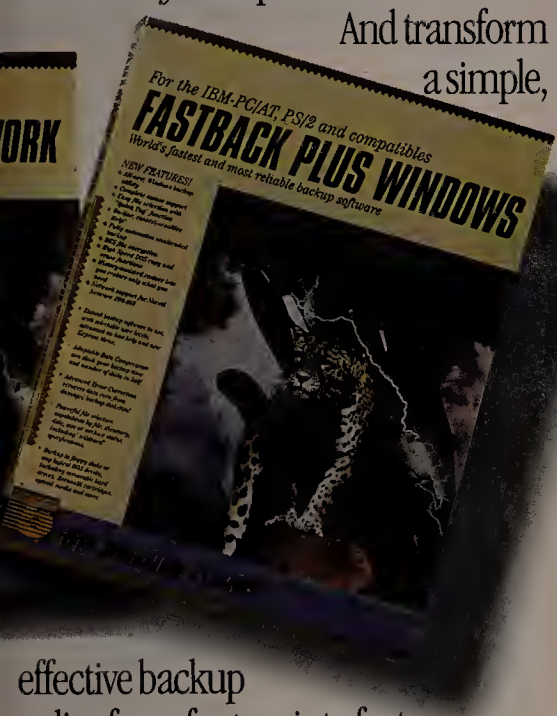

All you need is Fastback Plus.

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We wouldn't recommend trying this test yourself. But if you insist, you'll be glad to know that Fastback Plus is backed up by our vaunted 24-hour toll-free technical support and a one-year money-back guarantee.

There's more. So pick up the phone. Dial 1-800-388-0362.

And tell everyone to stand back.

*Scheduling templates included in DOS, Windows and Network versions.

FIFTH GENERATION SYSTEMS, INC

VITAL STATISTICS

Street price: $2394
PROS: Inexpensive
CONS: Very slow, two slots blocked
Contact: 800/542-2355, 818/909-3501
Reader service no. 706

Bell 486DX/33

The good news here is easy to spot and comes adorned with dollar signs: This 33-MHz system is the fourth-cheapest PC we priced. It's startling to realize that this fully featured 486DX-33 can be sitting on your desk for only $2394—including 8MB of RAM, a standard complement of drives, and a full-color VGA monitor. After that, the story turns more downbeat. This is the slowest system in the roundup: It came in dead last on *WordPerfect* and next to last on *dBASE*. If you want to speed it up, you'll have to try a 33/66 OverDrive chip or get Bell to sell you a 50-MHz clock crystal and a 486DX-50 CPU. Bell's compact case includes six free slots, but two of them are blocked by the drive cage and can hold only half-length boards. The case has room for two more drive bays, so there is some room to grow. On-site service is affordable at $100 a year, and the three-day turnaround is nice. When we called the toll-free tech support line, we got accurate answers, but on several calls we had to wait for a tech. In spite of its poor performance, the Bell's low price gives it a better-than-average overall value—especially if the bottom line is your top priority.

VITAL STATISTICS

Street price: $2917
PROS: Fast, good service and support, lot of slots and bays
CONS: No weekend support
Contact: 800/531-7447
Reader service no. 707

Blackship BLK 486SX/25

Blackship is a frequent award winner in our pages, and its 486SX-25 system is a chip off the old ship—speeding into a fifth-place performance finish. Blackship builds its system around AMI's justly popular Super-Voyager motherboard. You can get the BLK 486SX/25 in three models, depending on the case you choose. A minitower and a compact version are available, but we chose to look at the desktop model. This full-size system will take up some space on your desk, but the trade-off is that it delivers six bays—four of them externally accessible—and seven free slots. The sys-

Late List Prices

To give you an idea of how system prices are moving, we contact vendors at press time for the latest available list prices and compare those figures with the list prices quoted when we began our research two months earlier. Since we cannot compare the prices quoted by direct and mail-order vendors with those quoted by vendors whose dealers discount from list prices, we use street prices as a basis for comparison. Researching street prices takes several weeks, so the prices we use are not as up-to-date as we would like. The changes in list price given in this table should help you to get a more up-to-date price estimate when considering a system.

While many system prices didn't change, most of those that did fell by substantial amounts. The biggest drop came from Everex, which lowered the price of its Tempo C Series 486SX/25 by $1100 to $3425. This reduction makes the Everex a significantly better value overall, but it's still one of the roundup's more expensive systems. The Northgate's lowered price—down $400 to $3028—makes that system a much better overall value.

When making your final buying decision, remember that prices will have dropped still more by the time you read this.

Big Price Cuts

	List price as of September 1992	Price drop from July 1992
Acma 486sx/25	$3024	none
ALR Flyer 32DT 4SX/25	$4065	$210
Amax 486 33/50 ISAmax Power Station	$2445	none
Ares 486-33 Sonic III	$2875	$125
ATronics ATI-486-33	$2195	$300
Axik Ace Cache 486/WB-33	$2398	none
Bell 486DX/33	$2720	$200
Blackship BLK 486SX/25	$2824	$93
Boss 486SX-25 Cache	$4124	none
Compaq Deskpro 4/25is	$3775	none
CompuTrend Premio Power PSX-425	$2189	$339
Copam 486B/33	$3150	$231
CSS Preferred 433GA	$2795	none
CUBE 433 ATX Upgradable	$3245	none
CUI Advantage 3486 486-33 ISA	$3176	none
EPS 486-33MHz ISA	$2195	$169
Everex Tempo C Series 486SX/25	$3425	$1100
FastMicro FastData 486SX/25	$2268	none
MIS 486-50/33 ISA	$2895	$200
Mitsuba Professional 486SX/25	$2609	none
Northgate Elegance ZXP 486SX/25	$3028	$400
PBS 486DX/33	$2645	none
Polywell 486SX/25	$2879	$250
Twinhead Superset 600/433C	n/a	n/a
Wyse Decision 486si	$3357	none

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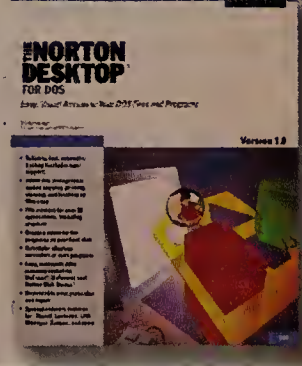

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tem includes an Orchid ProDesigner IIs video controller and a 212MB Conner hard drive. If a clock doubled 50 MHz isn't fast enough for you, simply replace the 25-MHz clock crystal with one that goes 33 MHz or 50 MHz, and install a matching 486DX CPU. Once the clock is up to 33 MHz, chances are good you'll eventually be able to OverDrive that to 66 MHz.

Blackship's service-and-support package is one of the best: You get a two-day turnaround guarantee on repairs, the first year of on-site service is free, and tech support has a toll-free number. When we called tech support, we got through quickly, and the answers were accurate and helpful. The Blackship's price is no better than average, but this system is a fine performer—and a solid value.

VITAL STATISTICS

Street price: $3809
PROS: Very fast, great service and support, highly expandable
CONS: Expensive
Contact: 800/628-1787, 404/636-2126
Reader service no. 708

Boss 486SX-25 Cache

This low-rise minitower is the second-fastest system in our roundup. It blazed into first place on the *Windows* test, second on the *WordPerfect*, *Paradox*, and *1-2-3* benchmarks, and third on *dBASE*. But its other notable feature isn't so wonderful: It's stuck with the second-highest price here. Naturally the minitower provides plenty of room for expansion: You get six bays (five of them accessible from the outside) and seven free slots. An oversize 239MB Seagate hard drive is part of the package too. The heavy-duty 300-watt power supply ensures that you'll be able to use all this space by delivering plenty of additional juice. Of course, a minitower is not for everyone. While a full-size tower under your desk has enough height to make it easy to reach the floppy slot, a mini may be an awkward stretch. And although a mini takes less desk space than a full-size unit, you can't put your monitor on top of it.

Want even more speed? Simply move a jumper to change the system clock to 33 MHz or 50 MHz, and drop in the appropriate DX CPU. The 33/66 OverDrive chip will probably work too, once the clock is properly set. Service and support is tops: Boss includes a generous two-year warranty and two years of free on-site service. If you need to send the system for repairs, you're guaranteed to get it back within two days. And while tech support doesn't work weekends, it is toll free, fast, and accurate.

The expansion options on the Boss 486SX-25 Cache, combined with its already good performance, mean that it will ultimately perform well on the upgrade path. This machine is a good choice for those with an eye to the future—whether they choose to jazz it up with a clock-speed boost or by adding a slew of peripherals.

Pricey? Yes indeed! But if you don't mind throwing money at your computing problems, this machine is a tempting choice.

VITAL STATISTICS

Street price: $3784
PROS: Fast, good service and support, Business Audio
CONS: Expensive, stingy on slots and bays
Contact: 800/345-1518
Reader service no. 709

Compaq Deskpro 4/25is

Compaq's vaunted list price cuts seem to be taking a long time to reach the street: $3784 is one of the highest prices we found. Compaq's Deskpro 4/25is is a good performer, with a fourth-place finish on our *Windows* benchmark to its credit—thanks, no doubt, to its motherboard-mounted QVision graphics accelerator. Combine that with a very fast cache, and you see why the Compaq finished sixth overall in performance—just outside our top five.

Several nice touches include integrated Business Audio—the equivalent of a simple soundboard with a microphone that lets you record and attach voice messages to *Windows 3.1* documents. And of course Compaq quality is legendary. In this case, the system is a compact desktop—tiny, relatively light, but still sturdy. It opens easily, and Compaq makes great use of space. Unfortunately, the case is so small that even with Compaq's design smarts, there isn't a lot of room left inside.

The Deskpro's high price and low expansion capacity (three bays, three free slots) cost it quite a few points in overall value. With so many better choices, this system doesn't make a compelling buy.

VITAL STATISTICS

Street price: $2680
PROS: Fast, reasonably priced, great service and support
CONS: Two blocked slots
Contact: 800/677-6477, 818/333-5121
Reader service no. 710

CompuTrend Premio Power PSX-425

A nice price and fleet performance give CompuTrend's Premio Power PSX-425 one of the better price/performance ratios in the roundup. The system includes a Western Digital Paradise Accelerator video board with an S3 chip for zippy screen updates. If you install a new clock crystal, you can drive a 486DX CPU at either 33 MHz or 50 MHz. But two slots are blocked by the drive cage and hold only half-length boards, and documentation is skimpy. Despite a two-day turnaround policy, CompuTrend's service-and-support package lacks BBS and week-

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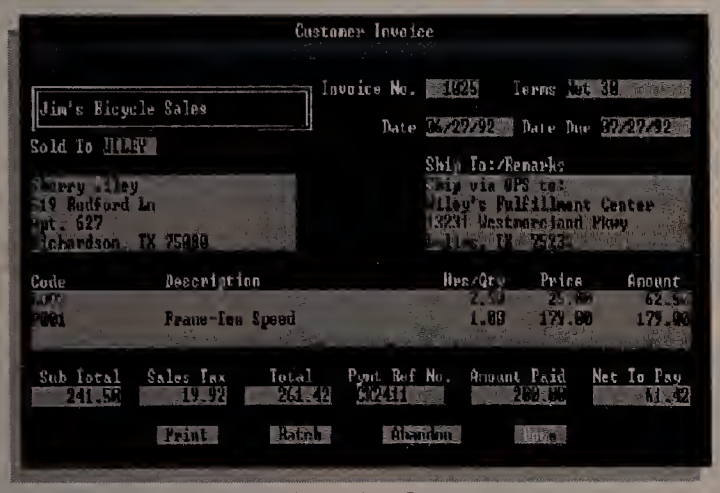
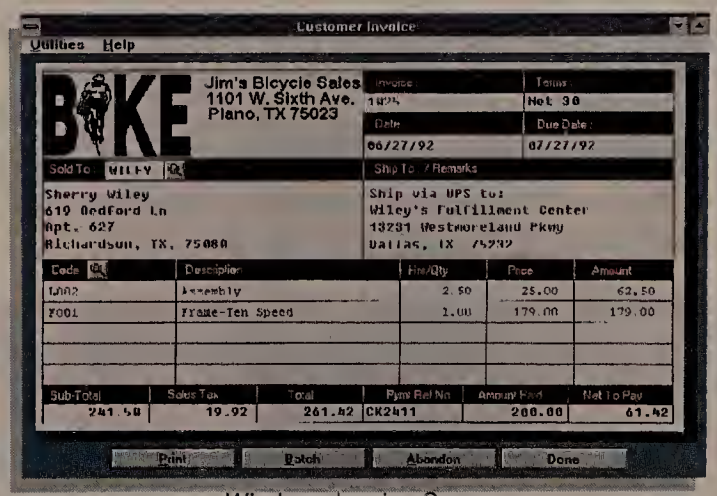


DOS Invoice Screen



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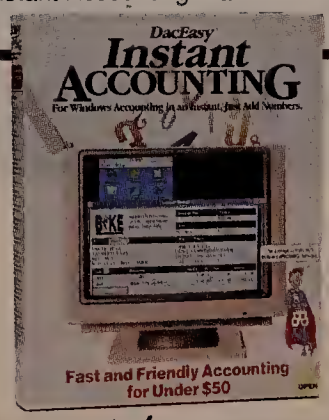

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end support, and its weekday support hours are relatively limited. Nor does it include dedicated support staff at the dealer.

In short, the Premio is a solid system—but in this fast company, it's not competitive enough to make it to the winner's circle.

VITAL STATISTICS
Street price: $2995
PROS: Good service and support
CONS: Very slow, expensive on-site service
Contact: 800/828-4200, 510/623-8911
Reader service no. 711

Copam 486B/33

Regrettably, this 33-MHz system is both slow *and* relatively expensive. In fact, it's the next-to-slowest system in the roundup, with a last-place finish on *dBASE* and a next-to-last result on *Windows*. Another problem is its dinky 160-watt power supply. The compact case fits comfortably even on crowded desks, but the trade-off is tight expansion capacity: only four free slots and four bays. And the "compact case" idea—more desk space—looks less compelling by the moment; you can always put your PC under your desk.

Service and support is a mixed bag. The three-day repair turnaround is great, and when we called tech support, we got fast, accurate answers. But on-site service costs 8 percent of the system price, which in this case adds up to a whopping $270 a year.

You have two CPU upgrade options: You can install a 50-MHz CPU board, or try a 33/66 OverDrive chip. But our recommendation would be to save the time and trouble and buy another PC in the first place.

VITAL STATISTICS
Street price: $3543
PROS: Good service and support
CONS: Slow, expensive
Contact: 800/966-2771, 714/852-8161
Reader service no. 712

CSS Preferred 433GA

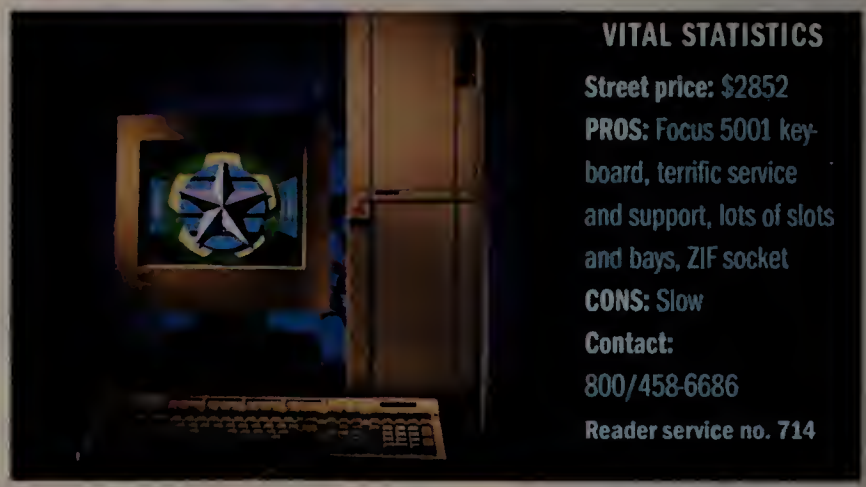
Like Copam's 486B/33, CSS's Preferred is relatively slow and expensive—a dangerous combination with so many strong candidates in the vicinity. This 33-MHz system boasts a local-bus video slot, and while we expected it to deliver blazing *Windows* performance, the final test numbers show the Preferred in the middle of the list. The lesson here may be that premium video performance requires a precise match of slot, graphics board, and system architecture. The Preferred boasts a full-size desktop case that holds plenty of slots and bays. If you ever want to upgrade the CPU, you can replace the 33-MHz processor board with a 50-MHz version—or keep the 33-MHz board and try the 33/66 OverDrive chip. A fine service package includes free on-site repairs and a four-day turnaround guarantee (dealer service policies include an inventory and parts requirement). Toll-free tech support gave us fast, mostly accurate answers. Still, you can do better.

VITAL STATISTICS
Street price: $3245
PROS: Good service and support, lots of slots and bays
CONS: Slow, pricey, two slots blocked
Contact: 800/522-2823
Reader service no. 713

CUBE 433 ATX Upgradable

Speed fanatics can skip to the next review. CUBE's 33-MHz ATX is relatively poky—it came in third from last on *Windows*—on top of which, it's fairly expensive. Fortunately, this low-rise minitower does deliver six drive bays and six free slots, and there's a slick one-day turnaround guarantee. Unfortunately, two of the slots are limited to half-length boards.

Upgrade path? Start by trying a 33/66 OverDrive chip (when it becomes available). Or move a jumper, and the adjustable clock will drive a 50-MHz 486DX. If you want to get tricky, you can try *slowing* the clock to 25 MHz and slap a 25/50 clock doubler into the Intel upgrade socket to reach 50 MHz for less money. But with one of the worst price/performance ratios here, this system is not recommended.



VITAL STATISTICS
Street price: $2852
PROS: Focus 5001 keyboard, terrific service and support, lots of slots and bays, ZIF socket
CONS: Slow
Contact: 800/458-6686
Reader service no. 714

CUI Advantage 3486 486-33 ISA

Want the bad news first? CUI's 33-MHz Advantage is slow! It placed next to last on both *1-2-3* and *Paradox* and ended up being the third-slowest system in the review. But remember, while this system is one of the slowest in its class, its class is light-years ahead of what most people have on their desks. In any case, the rest of the news is sunnier. As the icon at the top of this review

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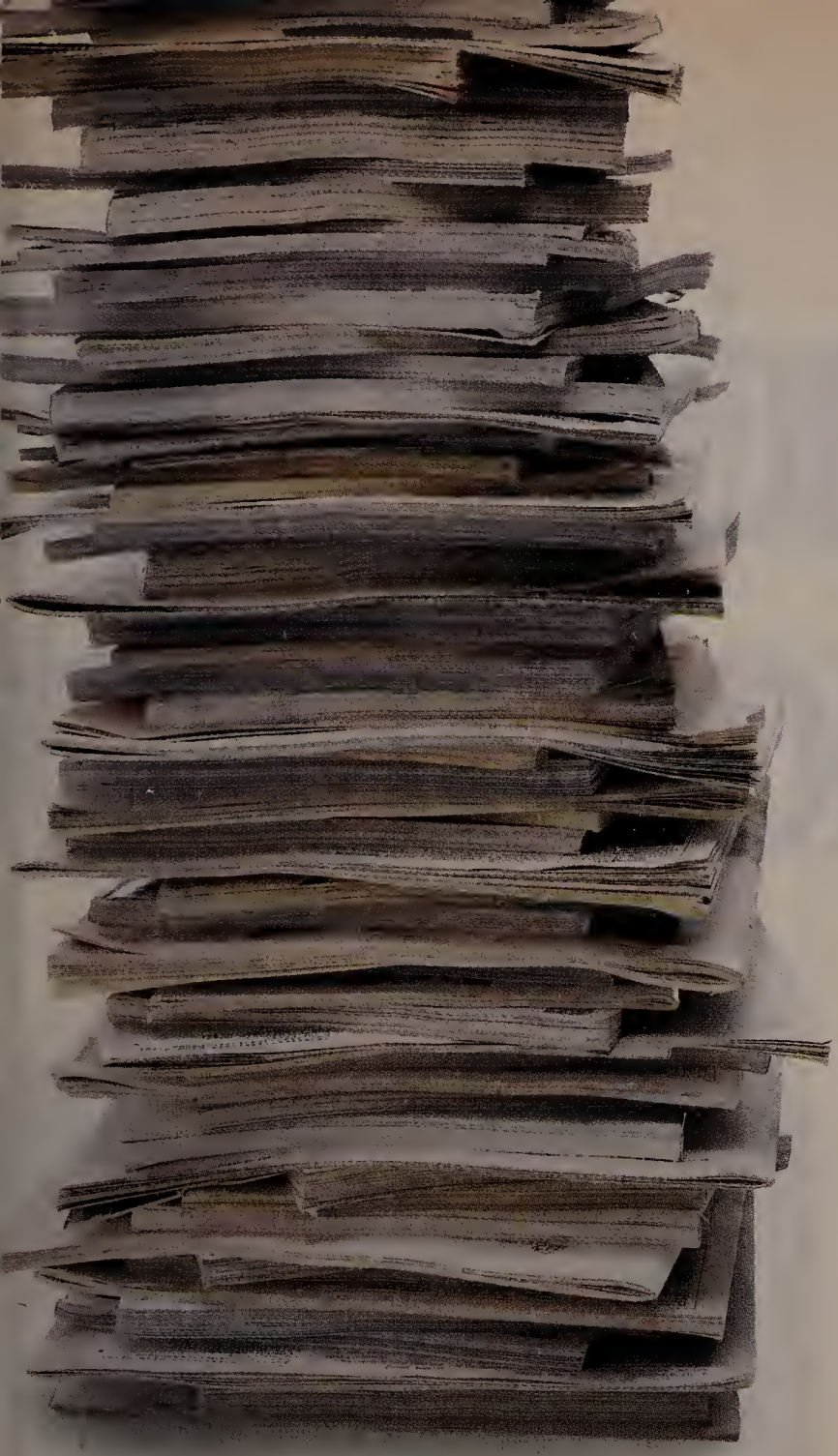

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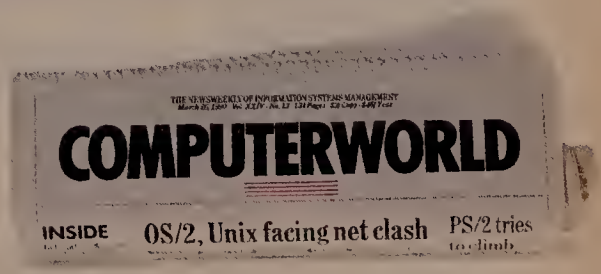

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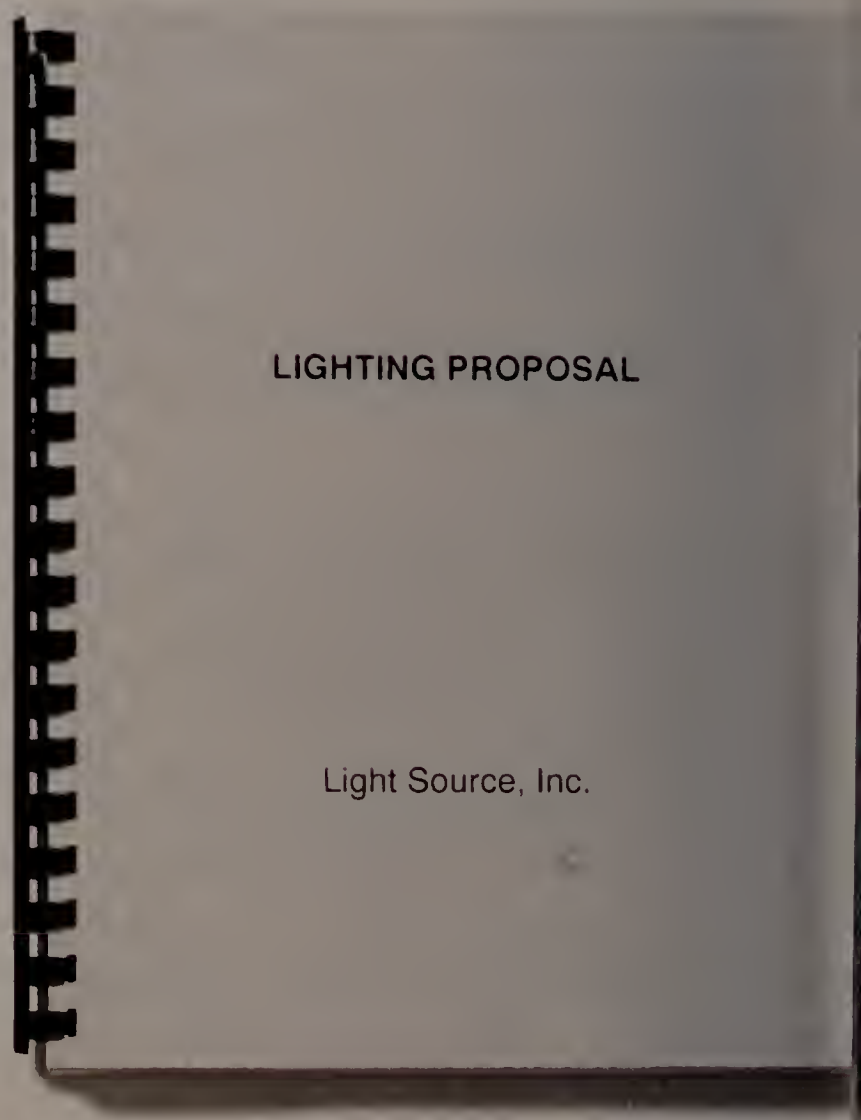

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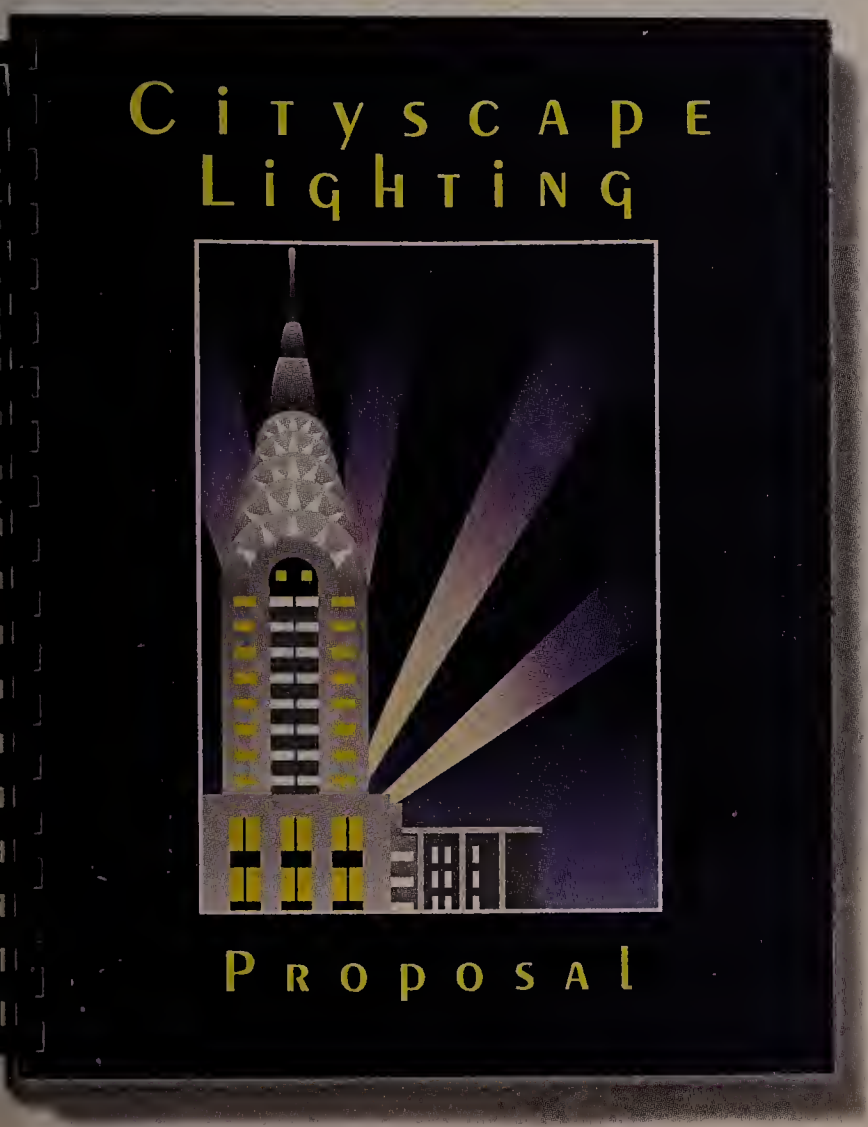

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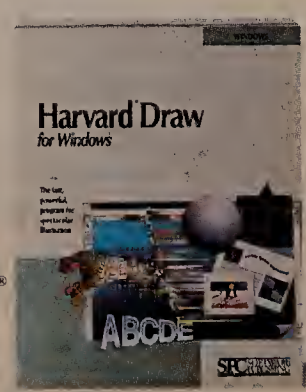

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indicates, CUI's service-and-support package is top-notch. On-site service is available for a nominal $50 a year, there's a guaranteed two-day turnaround on factory repairs, tech support is toll free, and our test questions were answered quickly and accurately.

This full-size tower packs nine bays and six free slots (with a hefty 280-watt power supply to keep them running). A number of thoughtful design touches make it a pleasure to use: The CPU is mounted in a ZIF socket for easy upgrade. You get a great Focus 5001 keyboard with a built-in calculator and two sets of function keys—the familiar horizontal row above the alphanumeric keys, and the older layout with twin vertical rows on the left. A copy of *PFS:WindowWorks* is included at no extra cost. If you want to upgrade the CPU, you have several options. Presumably, a 33/66 OverDrive chip will work, or you can install a 50-MHz clock crystal and a 486DX-50 from CUI. Either way, once you solve the speed problem, this system can be a real winner.

VITAL STATISTICS
Street price: $2364
PROS: Low price, fine service and support, strong expandability
CONS: Awkward drive placement
Contact: 800/447-0921
Reader service no. 715

EPS 486-33MHz ISA

EPS's 33-MHz tower is not one of the fastest systems here—it's not even one of the fastest 33s. (It did get a respectable *Windows* score thanks to a Cardinal Tech VGA card. A 256K external CPU cache couldn't have hurt, either.) But thanks to extremely low price, excellent expansion capacity, and a good balance of design features, the system snags a solid fourth place for overall value. Nine drive bays (six of them externally accessible) leave plenty of room for peripherals such as CD ROM drives, tape backup, and floppies; the only drawback is that the bays are located halfway down the front of the case, making them slightly awkward to reach. *Windows* comes preinstalled, which means you won't have to go through the tedious installation process—or face confusing questions about your hardware.

If you need more speed, you have a number of options: EPS will sell you a 50-MHz clock crystal and a 486DX-50 CPU. And a 33/66 OverDrive chip will most likely work fine when Intel makes it available. The system's service-and-support package is good—it includes a 60-day money-back guarantee, a year of free on-site service, a toll-free tech support line you can call for the lifetime of the system, guaranteed three-day repair turnaround, and weekend support. Getting through on the tech support line took a while, but once connected, we got accurate answers.

The EPS would make an excellent choice for someone looking for a very cheap server or for someone who wants to buy cheap now, expand later, and count on getting good support throughout the life of his or her machine.

VITAL STATISTICS
Street price: $4174
PROS: Fast
CONS: Very expensive, limited expansion capacity
Contact: 800/821-0806, 510/498-1111
Reader service no. 716

Everex Tempo C Series 486SX/25

Speed is always appealing, and Everex's Tempo C has it in spades. This OverDriven 25/50 was the fourth-fastest PC we tested. Some of the credit must go to an integrated video solution, and the 128K external CPU cache also played its part.

Unfortunately, speed isn't enough to make this system a smart buy—and the Tempo C has little else to offer. It's the most expensive PC here, and once you install the 25/50 OverDrive chip, your upgrade path hits a dead end: While the CPU is mounted on a replaceable processor board, Everex doesn't sell a faster one. And the compact case is quite stingy with bays and free slots—you get only three of each. Even the power supply is underpowered at 145 watts. Service and support isn't bad, although the tech support line requires a toll call.

If speed is a priority, take a look at the Everex Tempo C. But its price—despite a late price cut—and poor expandability really hurt this system. We think there are smarter choices than the Tempo C.

VITAL STATISTICS
Street price: $2268
PROS: Great price, plenty of slots and bays
CONS: Recurring customer complaints
Contact: 800/824-6000
Reader service no. 717

FastMicro FastData 486SX/25

If $2268 (including $629 for the 25/50 OverDrive chip) sounds like a swell price, we agree. The 25/50 FastData is the second-cheapest system here. But despite all the *fast*s in its name, it's still an average-to-slow performer. You can drop in a new crystal and speed the clock to 50 MHz, which opens several upgrade options. The full-size case holds six free slots and six drive bays. Also, at first glance the service-and-support package looks fine: Free on-site service for a year; two-day turnaround; toll-free tech support that works weekends; and fast, reasonably accurate answers.

But there's a nasty fly in this ointment. Our *Consumer Watch* department has received so many letters complaining about Fast-

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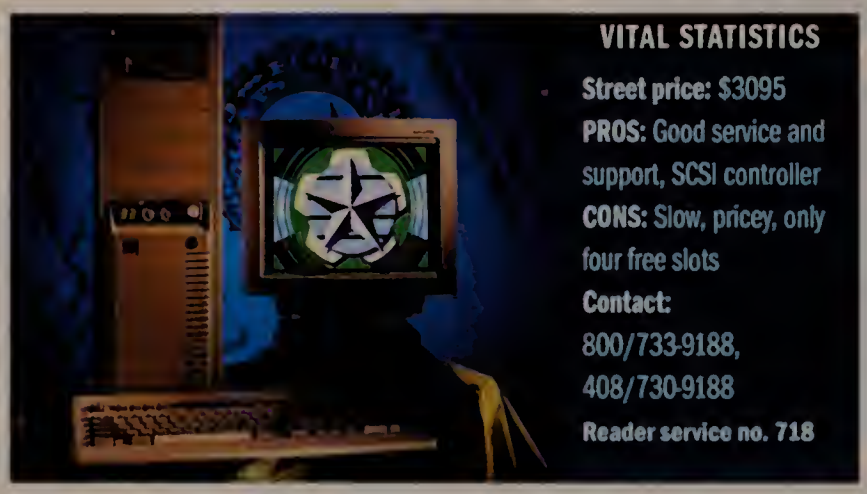
Micro that we're forced to issue a warning. Most of the complaints involve systems or components that were ordered and never arrived, or took several weeks longer to arrive than promised. In six months, our *Consumer Watch* editor received 25 complaints about failure to deliver, 18 of which involved a credit card being charged early. Eventually most of the problems were resolved with our help, but clearly service and support is a concern with FastMicro. As the service-and-support survey in this issue shows, FastMicro rates poorly with our readers on service and support, even though readers who received working systems do seem satisfied with them. The bottom line is that although FastMicro makes a good system, "buyer beware" is more than just a cliché here.



VITAL STATISTICS
Street price: $3095
PROS: Good service and support, SCSI controller
CONS: Slow, pricey, only four free slots
Contact: 800/733-9188, 408/730-9188
Reader service no. 718

MIS 486-50/33 ISA

Despite a respectable fourth-place finish on *Windows* and a SCSI drive controller that makes installing a CD ROM drive simple, it's hard to recommend MIS's 33-MHz tower. Its overall performance rating is disappointing—due to last-place scores on *1-2-3* and *Paradox*. And while its tower case holds nine drive bays, you're stuck with a stingy four free slots. Documentation is skimpy, and your only CPU upgrade option is to wait for Intel to release its 33/66 OverDrive and hope it works in this system. A one-day turnaround may seem appealing, but this system came in fifth-worst in overall value, which means you can easily do better.

VITAL STATISTICS
Street price: $3051
PROS: Decent performer, 15-month warranty
CONS: No central support
Contact: 800/648-7822, 714/392-2000
Reader service no. 719

Mitsuba Professional 486SX/25

This compact 25-MHz system turned in respectable performance numbers (with a 25/50 OverDrive chip installed), but it's not cheap—and one of its six free slots is limited to a half-length board. (While full-length boards are rare—due to engineers' ability to cram more circuitry onto smaller chips—you can be sure Murphy's Law will send you one just when all your other slots are full.) There's no central support, and even on-site service is handled through dealers, so there's no guarantee of how well you'll be treated. Should you grow bored with mere 50-MHz performance, just move a jumper to set the adjustable clock to 33 MHz and try a 33/66 OverDrive chip—once Intel starts selling them. Nonetheless, there are at least six or eight systems here we'd consider before we bought this one.

VITAL STATISTICS
Street price: $3428
PROS: Reasonably fast, fine service and support, highly expandable, ZIF socket
CONS: Expensive
Contact: 800/548-1993
Reader service no. 720

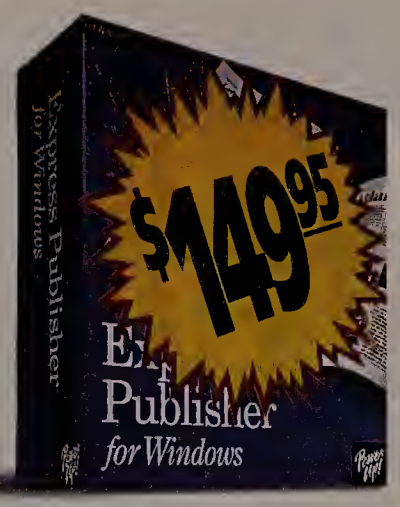
Northgate Elegance ZXP 486SX/25

The Elegance ZXP (a 25-MHz 486SX doubled to 50 MHz) turns in creditable performance scores, including a third-place finish on *Paradox*. It's fairly pricey, but you get an oversize 244MB Quantum drive. The compact case includes six free slots and four bays. If you want to keep your upgrade options unlimited, you'll be pleased to know that by moving a jumper, you can set the system clock to 33 MHz—and (probably) install a 33/66 OverDrive. Service and support is excellent: There's a year of free on-site service and a quick three-day turnaround, and toll-free tech support is available 24 hours a day, seven days a week. We got through to tech support quickly, but the answers were not always accurate. Good speed (just behind our top five) and expansion make this an attractive option if you're after present and future performance. Adding it all up, the ZXP is a tempting system—but not if you're on a budget.

VITAL STATISTICS
Street price: $2645
PROS: Reasonable price, good Windows performance, nice keyboard, two-year warranty
CONS: Two slots blocked
Contact: 800/899-8269
Reader service no. 721

PBS 486DX/33

PBS's handsome black minitower holds five drive bays and seven free slots—but two of the 8/16-bit slots are blocked by the drive cage, which means they're limited to half-length boards. While it can't keep up with the doubled 25s, it's still one of the fastest 33s we tested. It placed quite high on the *Windows* test, due, no doubt, to its ATI Graphics Ultra video accelerator board. Another plus is its



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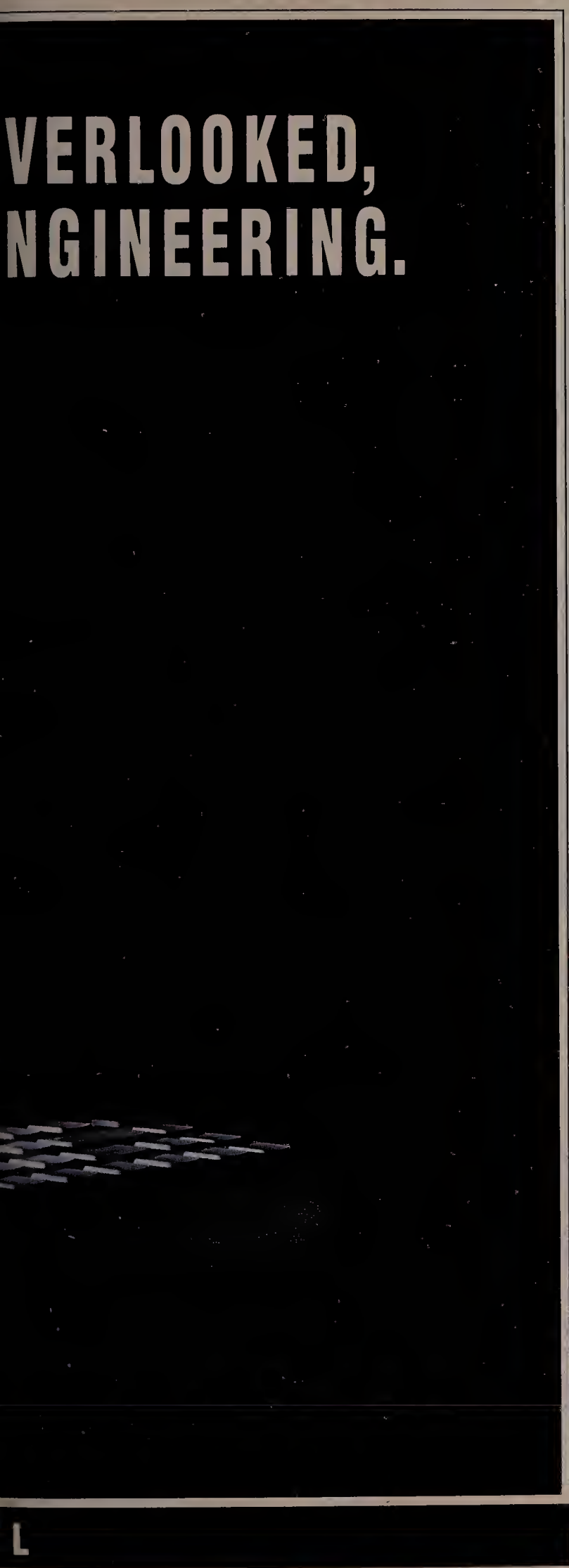

PC MAGAZINE EDITORS' CHOICE

August 1992
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Focus 5001 keyboard with built-in calculator and two sets of function keys. If you want to upgrade the CPU, you can drop in a 50-MHz crystal and a matching CPU or wait for the 33/66 OverDrive chip. The PBS came with a 256K cache, helping account for its good finish compared with other 486DX-33s. PBS supplies optional hard drive expansion up to a mammoth 2.5GB. Service and support were merely average, and little else stands out about this minitower. It's a fairly good value, but better choices are available.

VITAL STATISTICS

Street price: $3129
PROS: Two-year warranty, great service and support
CONS: Pricey
Contact: 800/999-1278, 415/583-7222
Reader service no. 722

Polywell 486SX/25

Looking at Polywell's 486SX/25, nothing really stands out: It's an average performer overall with average expansion capacity. The Polywell scored a creditable top-ten finish on our *dBASE* test, but its other performance scores weren't so good. Yet its balance of features (and lack of problems) helps it score one of the highest overall values here—just shy of a Best Buy. And if you want to add speed, there's a possible solution: Buy a 33-MHz clock crystal from Polywell, and try out one of Intel's 33/66 OverDrive chips when they hit the market.

Polywell's service-and-support package is a perfect example of what to demand: At $75 a year, on-site service is relatively inexpensive, the warranty runs two years, the company promises to complete repairs within two working days, and the toll-free tech support line works weekends. Despite its lack of flashy features, we don't hesitate to recommend this solid system.

VITAL STATISTICS

Street price: $2085
PROS: Very low price, good service and support, compact case
CONS: Slow, relatively small hard drive
Contact: 800/545-8946
Reader service no. 723

Twinhead Superset 600/433C

If Jack Benny were alive and looking for a PC, Twinhead's 33-MHz Superset might be his choice. It's the cheapest system here—but also one of the slowest, with a last-place finish on the *Windows* benchmark. Nor is that its only drawback: Its Conner hard drive holds 162MB, and while that's fairly roomy, it's still the smallest capacity here. The power supply delivers a stingy 145 watts. You're limited to four free slots and four bays. And your only CPU upgrade path is to wait for Intel to release its 33/66 OverDrive—and hope it works in the Superset.

Twinhead doesn't quote list prices for its systems, so you won't get any information on price changes in our "Late List Prices" sidebar. Since the Twinhead was the cheapest system in the roundup, this shouldn't affect your decision greatly.

The Superset 600/433C comes with an integrated video controller, usually an indicator of good video performance, but in this case the reverse is true. To boost *Windows* performance, you're going to have to give up one of the precious four free slots in this system for a faster video card.

One nice touch: If you expect to be working under the hood, you'll be glad to know that the case glides on and off with amazing smoothness. Service and support includes a nice three-day turnaround guarantee and a year of free on-site service—but tech support doesn't work weekends. Given the Superset's slow performance and limited upgrade path, we suggest you look elsewhere.

VITAL STATISTICS

Street price: $2753
PROS: ZIF socket, easy-open case
CONS: Two slots blocked
Contact: 800/438-9973, 408/473-1200
Reader service no. 724

Wyse Decision 486si

Much like the Polywell, the Wyse Decision lacks any single dramatic feature but scores big on overall excellence. This 25/50 SX is only an average performer, but it's quite reasonably priced. Also, its ergonomic design is unusually thoughtful: An easy-open case makes getting under the hood a snap, and once you're inside, a ZIF socket and jumper-adjustable system clock make it easy to swap up to a 33/66 OverDrive CPU or a 486DX-50.

The Wyse Decision includes one of the early local-bus implementations for its video controller. Unfortunately, we didn't see any performance improvement with this design, because components aren't yet available to take full advantage of the 32-bit data path and higher clock rate for video. When the components are ready, you should be able to get a local-bus video card that can add some oomph to this system's video speed.

A full-size desktop case provides five drive bays (all externally accessible) and six free slots, but two 8/16-bit slots are limited to half-length boards. On-site service is affordable at $99 a year, the three-day turnaround guarantee is reassuring, and the tech support line is toll free. Lacking standout features or blazing test scores, "balance of excellence" systems like the Decision are a little hard to write about. But make no mistake: This is a top-drawer system and one of the smartest buys you can find.

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–Peggy Turner, CFO

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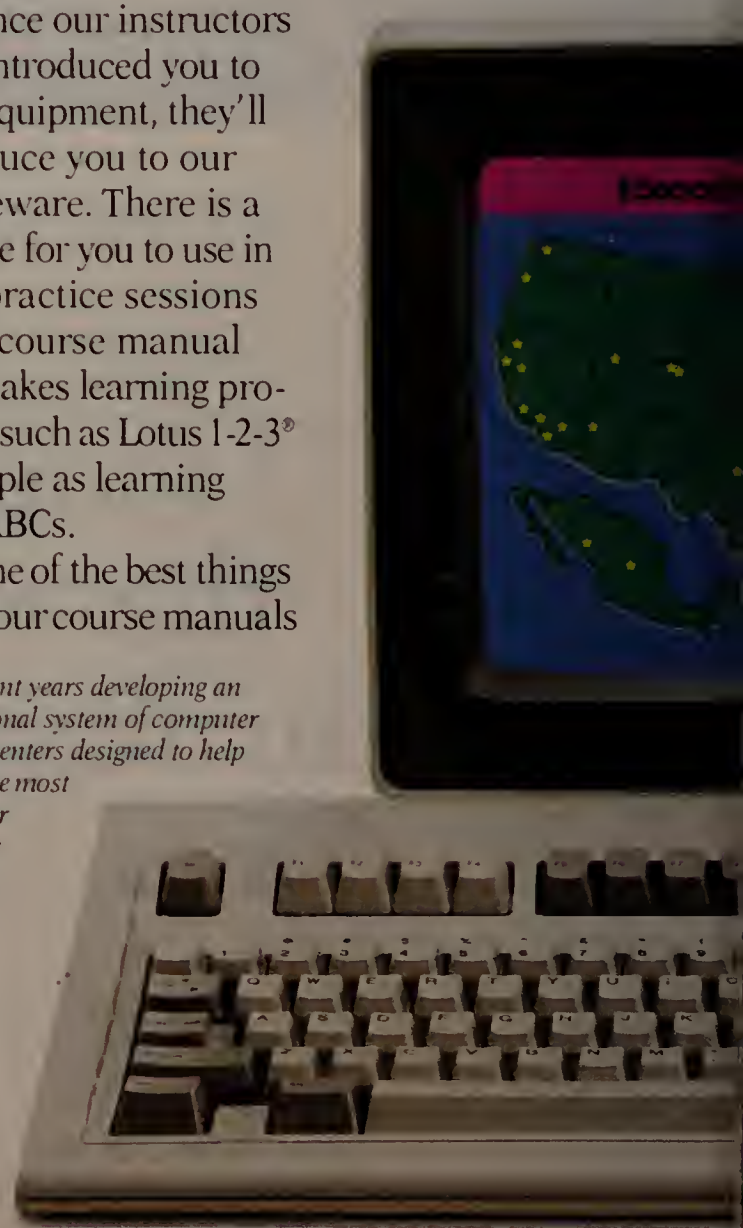

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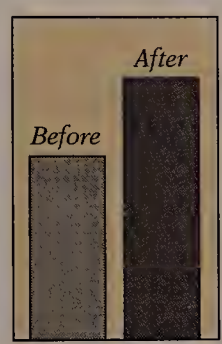

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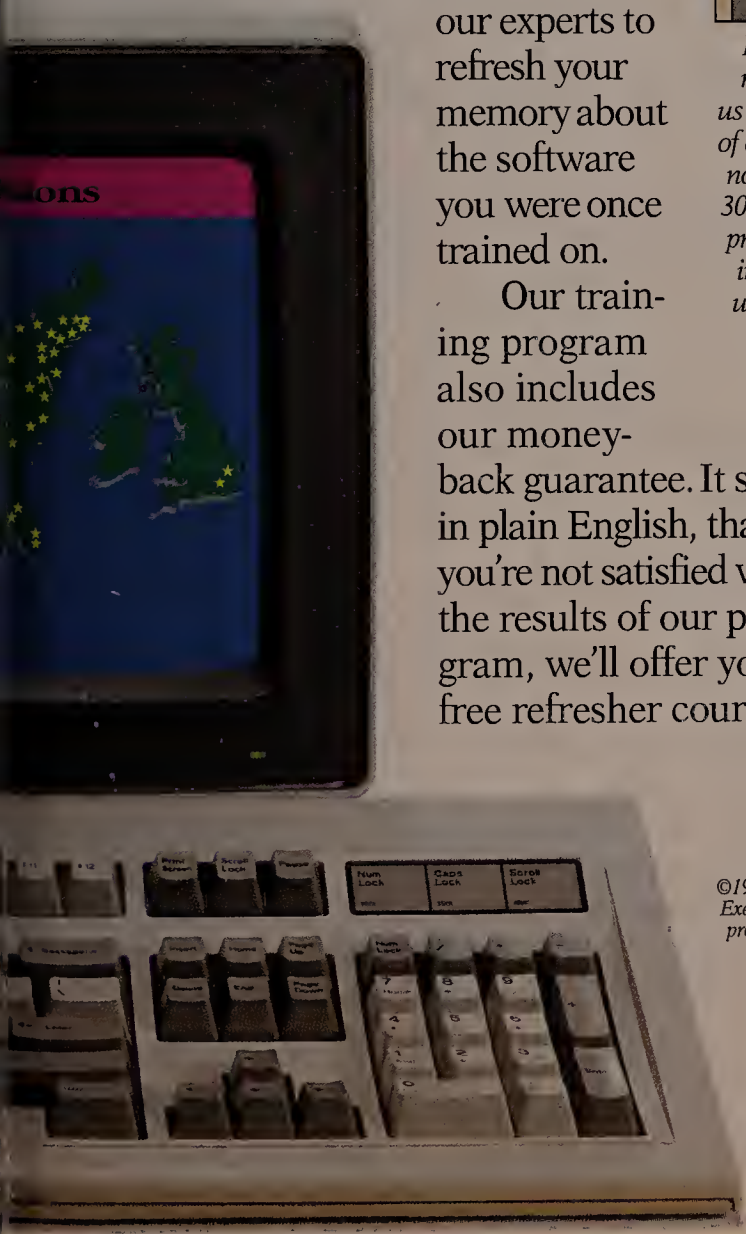

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FEATURES COMPARISON

12 OverDriven 486SXs Go the Distance With 13 486DX-33s

● Yes
○ No
n/a = not applicable

	BEST BUY Acma 486sx/25	BEST BUY ALR Flyer 32DT 4SX/25	Amax 486 33/50 ISAmax Power Station	Ares 486-33 Sonic III	BEST BUY ATronics AT-486-33	Axik Ace Cache 486/WB-33	Bell 486DX/33	Blackship BLK 486SX/25	Boss 486SX-25 Cache	Compaq Deskpro 4/25Is
Standard features										
Street price 7/92[1]	$3024	$3801	$2661	$3000	$2495	$2398	$2394	$2917	$3809	$3784[2]
Installed size of external memory cache	256	256	64	128	64	64	64	64	64	64
Maximum size of external memory cache	256	256	256	512	256	256	256	256	256	64
Hard disk	Seagate ST3283A	Maxtor 7213AT	Quantum 240AT	Quantum 240AT	Maxtor 7213AT	Quantum ProDrive LPS	Maxtor 7213AT	Conner CP3204F	Seagate ST3283A	Conner CP3201G
Size (MB)	244	200	244	244	202	234	213	212	239	210
Power supply (watts)	250	145	250	250	250	250	200	250	300	145
Motherboard	Helm	ALR	Amax	Ares/Tech. Power	Atronics	Axik	Bell	AMI	AMI	Compaq
Graphics controller	Diamond Stealth VRAM	Integrated	Diamond SpeedStar VGA	Ares Sonic Spectrum	Diamond Stealth VRAM	Diamond Stealth VRAM	Bell Freedom Turbo FX	Orchid ProDesigner IIs	Genoa Multimedia Model 7900	Compaq QVision
Expandability										
Free 32-/16-/8-bit expansion slots	0/5/0	0/3/0	0/4/1	0/5/0	0/5/0	0/6/0	0/5/1	0/6/1	0/6/1	0/3/0
Accessible/internal drive bays	4/1	2/1	4/4	4/2	6/3	5/3	5/0	4/2	5/1	2/1
Largest hard disk option	1.2GB	535MB	2.1GB	1.2GB	500MB	1.7GB	340MB	1.7GB	535MB	510MB
CPU upgrade options										
Replaceable CPU board	○	●	○	●	○	○	○	○	○	○
User-adjustable or user-replaceable clock	●	○	●	●	●	●	●	●	●	●
Accepts OverDrive or DX2 chip[4]	●	●	●	●	●	●	●	●	●	●
ZIF socket	○	○	○	○	○	●	○	○	○	○
Fast-RAM capacity on motherboard (MB)	32	36	32	64	32	32	32	32	32	32
Fast-RAM capacity on dedicated memory board (MB)	32	0	64	64	32	32	0	0	0	32
Design and construction										
Case	compact	compact	tower	desktop	tower	tower	compact	desktop	minitower	compact
Parallel/serial/mouse ports	1/2/0	1/2/1	1/2/0	1/2/0	1/2/0	1/2/0	1/2/0	1/2/0	1/2/0	1/1/1
Front-panel on/off switch	●	●	●	●	●	●	○	●	●	●
Front-panel reset switch	●	●	●	●	●	●	●	●	●	○
Service and support										
Warranty (months)	12	12	12	24	12	12	12	12	24	12
On-site service available for less than $100 per year	○	●	●	●	●	●	●	●	●	●
Turnaround guarantee (days)	none	3	7	3	3	2	3	2	2	none
Free unlimited support	●	●	●	●	●	●	○	●	●	●
Vendor support										
Toll-free central support	●	●	●	●	●	●	●	●	●	●
Daily support (hours)	11	10	11	24	9	9	8	9	10	12
Weekend support	●	●	●	●	○	●	○	○	○	○
BBS	●	●	●	●	○	●	○	○	●	●
Fax	●	●	●	●	●	●	●	●	●	●
Vendor-to-dealer support										
Dedicated support staff required	no dealers	○	●	no dealers	no dealers	no dealers	○	no dealers	○	●
Support staff training required	no dealers	○	○	no dealers	no dealers	no dealers	○	no dealers	○	●
Dedicated support line for dealers	no dealers	●	●	no dealers	no dealers	no dealers	○	no dealers	○	●
Inventory and parts requirement	no dealers	○	●	no dealers	no dealers	no dealers	○	no dealers	○	●

[1] Includes 8MB RAM, 64K or larger external cache, 150MB or larger hard drive, two floppy drives, one parallel port, two serial ports, VGA video card, and color monitor. 486SX-25 system prices also include $629 for a 25/50 OverDrive chip.

[2] Includes Business Audio hardware.

CompuTrend Premio Power 25	Copam 486B/33	CSS Preferred 433GA	CUBE 433 ATX Upgradable	CUI Advantage 3486 486-33 ISA	BEST BUY EPS 486-33MHz ISA	Everex Tempo C Series 486SX/25	FastMicro FastData 486SX/25	MIS 486-50/33 ISA	Mitsuba Professional 486SX/25	Northgate Elegance ZXP 486SX/25	PBS 486DX/33	Polywell 486SX/25	Superset 600/433C	Twinhead 486si	BEST BUY Wyse Decision
$2680	$2995	$3543	$3245	$2852[3]	$2364	$4174	$2268	$3095	$3051	$3428	$2645	$3129	$2085	$2753	
64	128	64	128	64	256	128	64	64	128	64	256	64	564	64	
256	256	256	256	256	256	128	256	256	256	256	256	256	64	256	
WD Caviar 2200	Seagate ST1239A	Conner CP3204F	Maxtor Q993TE	Maxtor 7213AT	Maxtor 7213AT	Seagate ST1239A	WD Caviar 2200	Maxtor LXT21354	Maxtor 7213AT	Quantum 240AT	Maxtor 7213AT	Maxtor 7213AT	Conner CP30174E	Maxtor 213A	
213	210	202	212	212	212	210	207	211	207	244	218	207	162	200	
200	160	200	250	280	220	145	200	250	200	200	220	230	145	200	
Computrend	Copam	CSS	Deico	CUI	EPS	Everex	Silicon Integrated	Micronics	Mitsuba	NSLCOM REV P2	AMI	Polywell	Twinhead	Wyse Technologies	
WD Paradise Accelerator	TVGA 8900C	CSS MaxGraphics	Orchid Fahrenheit 1280	Turbo F/X	Cardinal Tech VGA 765	integrated	TS VGA	Orchid ProDesigner IIs	VGA Mentor	Orchid Fahrenheit 1280	ATI Graphics Ultra	Orchid Fahrenheit 1280	integrated	local-bus "Hyper 16 Video"	
0/4/2	0/4/0	0/5/0	0/5/1	0/4/2	0/4/2	0/3/0	0/5/1	0/4/0	0/4/2	0/5/1	0/6/1	0/6/0	0/4/0	0/5/1	
5/0	3/1	3/2	4/2	6/3	6/3	2/1	5/1	6/3	3/1	3/1	4/1	5/0	3/1	5/0	
1.2GB	560MB	1.2GB	1.2GB	2GB	1.3GB	1GB	1.2GB	1.2GB	600MB	1.5GB	2.5GB	2GB	500MB	200MB	
○	●	●	○	○	○	●	○	○	○	○	○	○	○	○	
●	○	○	●	●	●	○	●	○	●	●	●	●	○	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
○	○	○	○	●	○	○	○	○	○	●	○	○	○	●	
32	16	32	64	32	32	32	32	32	32	32	32	32	32	64	
0	0	0	0	32	0	0	0	32	32	0	0	0	0	0	
compact	compact	desktop	minitower	tower	tower	compact	desktop	tower	compact	compact	minitower	compact	compact	desktop	
1/2/0	1/2/0	1/2/1	1/2/1	1/2/0	1/2/0	1/2/0	1/2/0	1/2/1	1/2/0	1/2/0	1/2/0	1/2/0	1/2/0	1/2/1	
○	●	○	●	●	●	●	●	●	○	○	●	●	●	●	
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
12	12	12	12	12	12	12	12	12	15	12	24	24	12	12	
●	○	●	●	●	●	●	●	●	●	●	●	●	●	●	
2	3	4	1	2	3	3	2	1	n/a	3	none	2	3	3	
●	●	●	●	●	●	●	●	●	n/a	●	●	●	●	●	
●	●	●	●	●	●	○	●	●	n/a	●	●	●	●	●	
8.5	11.5	13	11	9	12	12	10	10	n/a	24	9	9	10	8	
○	○	○	○	○	●	○	●	○	n/a	●	●	●	○	○	
○	●	●	○	●	●	●	●	○	n/a	●	○	●	●	●	
●	●	●	●	●	●	●	○	●	n/a	●	●	●	●	●	
○	○	○	no dealers	●	no dealers	○	no dealers	no dealers	○	no dealers	no dealers	no dealers	○	no dealers	
○	○	○	no dealers	○	no dealers	○	no dealers	no dealers	○	no dealers	no dealers	no dealers	○	no dealers	
●	○	●	no dealers	●	no dealers	●	no dealers	no dealers	●	no dealers	no dealers	no dealers	○	no dealers	
○	○	●	no dealers	●	no dealers	○	no dealers	no dealers	○	no dealers	no dealers	no dealers	○	no dealers	

[3] Includes PFS:WindowWorks.

[4] 25/50 guaranteed; 33/66 to be determined.

TEST REPORT

OverDrive Boosts 486SX-25s to Peak Performance Levels

In order by overall performance	1-2-3 2.2	Windows 3.0	WordPerfect 5.1	dBASE IV 1.1	Paradox 3.5
Acma 486sx/25*	121	46	32	207	355
Boss 486SX/25 Cache	122	46	33	212	361
ALR Flyer 32DT 4SX/25	121	47	35	[illegible]	445
Everex Tempo C Series 486SX/25	125	51	35	235	458
Blackship BLK 486SX/25	125	55	36	[illegible]	[illegible]
Compaq Deskpro 4/25is	125	54	36	[illegible]	[illegible]
CompuTrend Premio Power PSX-425	134	56	37	[illegible]	410
Northgate Elegance ZXP 486SX/25	140	59	38	[illegible]	[illegible]
Mitsuba Professional 486SX/25	130	56	38	[illegible]	[illegible]
Polywell 486SX/25	130	81	37	[illegible]	474
Wyse Decision 486si*	139	59	38	[illegible]	[illegible]
FastData 486SX/25	138	63	39	[illegible]	[illegible]
Axik Ace Cache 486/WB-33*	177	58	37	262	[illegible]
Amax 486 33/50 ISAmax*	178	59	39	[illegible]	417
PBS 486DX/33	177	55	40	[illegible]	474
Ares 486-33 Sonic III	179	63	40	[illegible]	[illegible]
EPS 486/33 MHz ISA*	176	58	40	243	[illegible]
ATronics ATI-486-33	180	60	40	[illegible]	[illegible]
MIS 486-50/33 ISA	186	54	42	[illegible]	[illegible]
CSS Preferred 433GA	181	63	41	[illegible]	[illegible]
Cube 433 ATX Upgradable	180	[illegible]	41	[illegible]	[illegible]
Twinhead Superset 600/433C	180	74	42	[illegible]	[illegible]
CUI Advantage 3486 486-33 ISA	185	67	42	[illegible]	[illegible]
Copam 486B/33	184	70	42	[illegible]	[illegible]
Bell 486DX/33	184	69	46	[illegible]	[illegible]

*Best Buy

Time in seconds.

Methodology
We tested all the computers with 8MB RAM and hard disks from 200MB to 244MB, except for the Twinhead Superset 600/433C, which had 162MB. We used DOS 5.0. In the table above, systems are ranked on their overall performance, fastest to slowest. The overall performance figure is derived from the individual performance tests using a weighting for the relative importance of the individual applications. Where performance scores stand out from those surrounding them, whether they are faster or slower, it indicates an unusual gain or drop in speed on that particular test.

1-2-3 2.2
We load the application, followed by three separate worksheets (arithmetic, financial, and scientific). We make various changes and run recalcs on each. Finally, we use the *MAPS* add-in from Management Advisory Services of Seattle to run a number of financial forecasts.

Windows 3.0
Timing begins and ends at the DOS prompt. We launch *Windows* along with a macro that loads *Microsoft Excel* with a financial worksheet and initiates a recalc. Then the macro loads Lotus's *Ami Pro* along with a 50K document that contains a 500K TIFF image. Finally, the macro launches *Micrografx Designer*, opens a drawing, displays it on screen, and exits to DOS.

WordPerfect 5.1
We reformat three text files that vary in size from 5K to 55K. The files contain some boldface and underlining; one document includes a TIFF file.

dBASE IV 1.1
With the caching feature enabled, we complete an unindexed search for a single record in a 100,000-record parts table. Then we index the table, run the transaction processing module, and post 600 records.

Paradox 3.5
Starting with an orders table, we compare each record with an available stock table. The application finds the current price for the items and inserts the resulting record into an Invoice table. PCs with caching disk controllers tend to have a dramatic edge on this disk-intensive test. You can install a similar controller on any PC and reap a similar benefit.

Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

Do You Dream In Black & White Or Color?

EITHER WAY, YOUR DR

THE LEADERBOOK SERIES:

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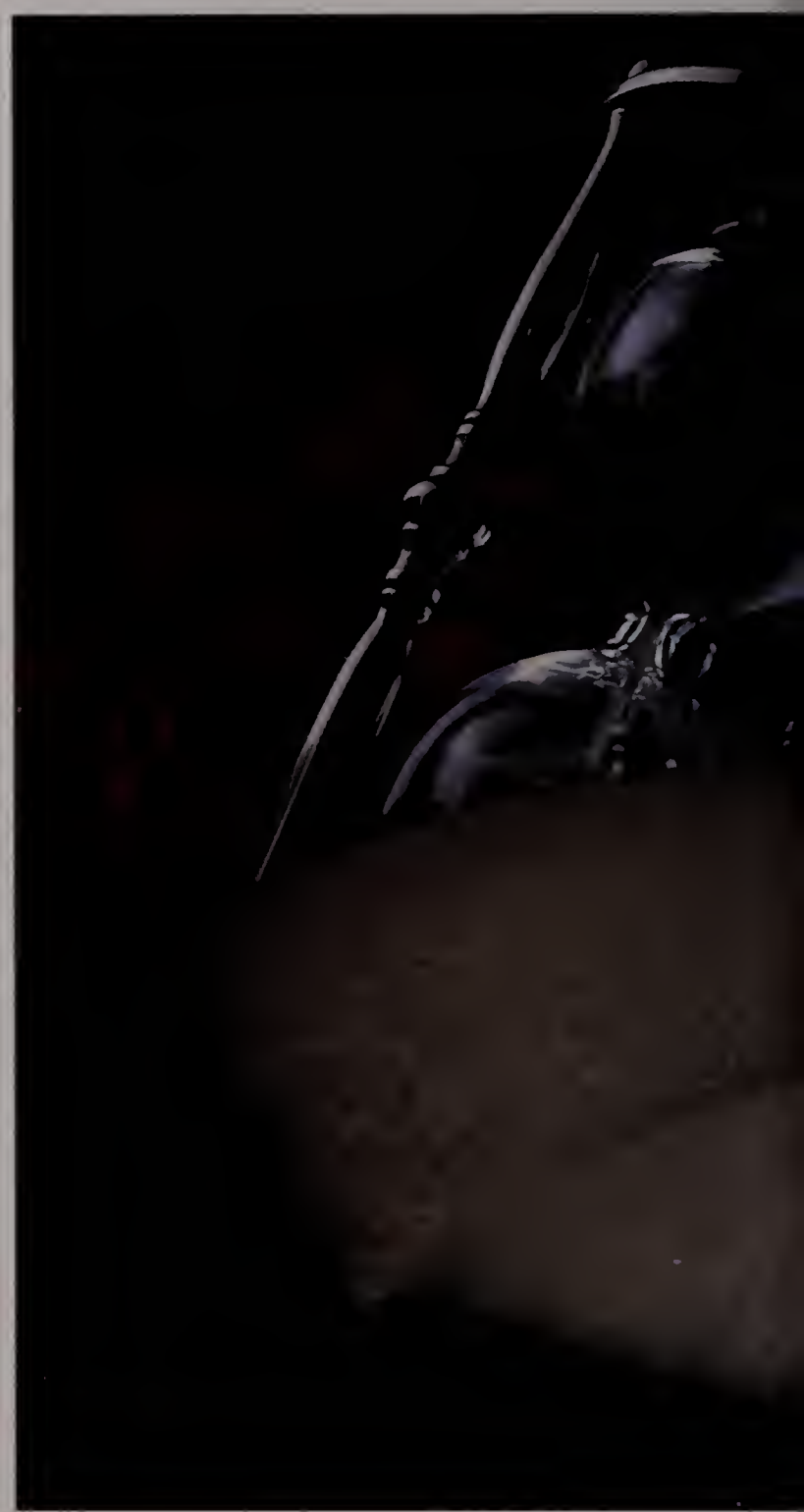
486/SLC Color
LEASE: $99/MONTH

$1995 120MB
486/SLC Monochrome
LEASE: $76/MONTH

Systems Include:
- 486/SLC processor
- 2MB RAM expandable to 18MB
- Internal 1.44MB, 3.5" drive
- Color VGA liquid crystal display (LCD), 640x480 resolution, 9" diagonal*
- External VGA monitor port
- Connector for docking station
- 1 parallel / 1 serial ports
- Dual NiCad batteries and power adapter
- Advanced power management features
- Full-size keyboard, inverted "T" cursor layout, 12 Function keys
- External port for keyboard
- Built-in 2-button Trackball
- MS-DOS® 5 and MS Windows™ 3.1 pre-loaded
- 8.2" x 11.6" x 1.8", only 6.2 lb.
- Carrying case
- Available options: FAX/modem, automobile adapter, spare NiCad battery, and docking station.

* Paper white VGA, 10" liquid crystal display, 640 x 480 resolution with 64 shades of gray on Monochrome LeaderBook

- 80MB and 120MB drives available on either LeaderBook.



The nature of dreams has obsessed analysts for years. But when the dreams are about high performance notebook computers, PC Brand has reassuring news: whether they're in color or black & white, there's a 486/SLC LeaderBook™ priced to make them come true.

The exciting new Color LeaderBook combines the impact of 64 colors with the blazing speed of a 486/SLC processor. When you look at the $2595 price tag, you'll think you're still dreaming. But the impressive list of features will be sure to wake you up.

The LCD panel displays nine system status icons.

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Hard as it is to believe, the price also includes dual NiCad batteries that you can change while the LeaderBook is in use, connector for docking station, and pre-loaded MS-DOS 5 and Windows 3.1.

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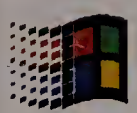

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Both LeaderBooks are backed by the service and support which led *PC Computing* to award PC Brand "a perfect 10 in performance," "a perfect 10 in price", and "the best service and support in its group" in its prestigious PCC 200 review. That means a 30-day, no-questions asked moneyback guarantee, one year 100% parts and labor coverage, unlimited toll-free phone and FAX technical support, and on-line bulletin board and CompuServe support. Plus the knowledgeable, friendly salespeople that make PC Brand an easy, reassuring shopping experience.

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marks or other service marks of their respective companies. • Rates based on 36-month open-ended lease. • Call for additional leasing options. • Leasing available to qualified businesses only.

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If your dreams turn to desktop systems, the PC Brand Leader series will make you wake up smiling.

While our competitors' so-called 'value' product lines cut costs by cutting corners in quality and expandability, PC Brand Leader systems are loaded with performance and convenience features that make them the very best desktop values available. Including 105MB hard drive, Super VGA color monitor and high speed cache memory on most models.

You'll find the attention to detail that PC Brand is famous for throughout the Leader series. Most models feature 5 expansion slots, 4 solidly-built drive bays, upgradable processor, a serious 200 watt power supply, and MS-DOS 5, Windows 3.1 and Works™ for Windows pre-loaded to make you more productive, more quickly.

Why PC Brand is the People's Choice.

Leader systems are engineered here in the USA by a design-oriented company with nearly a decade of experience in the PC business. And behind every PC Brand computer system is an engineering team of more than 100 people, whose technological expertise has resulted in over a dozen patents and numerous design innovations.

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The Leader Series:

$995 386/SX-25
LEASE: $38/MONTH

$1295 486/25
LEASE: $50/MONTH

Cache Systems:

$1495 386/40
LEASE: $57/MONTH

$1695 486/33
LEASE: $60/MONTH

$2195 486/DX2-50
LEASE: $78/MONTH

$2495 486/DX2-66
LEASE: $95/MONTH

Systems Include:†
- 4MB RAM expandable to 32MB
- 105MB IDE, 16ms drive (40MB on 386/SX-25)
- 1.44MB, 3.5" drive
- 1.2MB, 5.25" drive
- 16-bit SVGA, 1MB
- Super VGA color monitor (1024 x 768 resolution)
- 1 parallel/2 serial ports
- 5 expansion slots
- Upgradable processor
- Turbo button and key lock
- 200 Watt power supply
- 101-key enhanced keyboard
- Serial mouse
- MS Windows 3.1 and MS-DOS 5 pre-loaded
- MS Works for Windows pre-loaded (except 386/SX-25)

† Specifications for all Leader systems except 386/SX-25 and 486/25 which have 2MB RAM expandable to 16MB, 16-bit SVGA-512K, 3 expansion slots, non-upgradable processor.

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The People's Choice.

Readers Rate Direct-Sale Vendors

More than 4000 PC World readers can't be wrong. Discover how they rank the service, tech support, and hardware reliability of leading mail-order PC vendors.

Mail-order vendors have historically competed by offering bare-bones systems at rock-bottom prices, leaving it to the larger companies—with presumably deeper pockets—to offer comprehensive service-and-support options.

Things have changed, though, from the early days when price was king. It takes more than just aggressive pricing to compete in today's fierce PC marketplace, even for mail-order companies. Increasingly, these firms are offering a range of support options for service-conscious consumers.

To assess the reliability of mail-order PCs and the service and support that vendors provide, we set up a toll-free line and invited readers who'd purchased a system by phone or mail in the last two years to tell us about their experience.

By Roberta Furger

During June and July over 4000 people called, sharing information on 432 companies. We found that even companies with similar policies, such as on-site repairs and toll-free technical support lines, have vastly different service track records.

As a group, mail-order buyers are very satisfied with their purchase (that may be due, at least in part, to the money they feel they saved by buying direct—an average of $900 by their estimates). Companies received high marks when buyers were asked to rate the performance, quality of service, and overall reliability of the system purchased. But when we pressed buyers for details about hardware problems and repair records, we uncovered some interesting statistics. Nearly half of the respondents (43 percent) said they had experienced at least one hardware problem or one software-related hardware problem. And most in this unlucky group didn't have long to wait before they were forced to put a company's service to the test. Nearly half of our respondents said that they had their first hardware problem within a month of buying the computer.

The reported failure rates are higher than one would expect. But before you decide to go the "safe" route and buy from IBM or Compaq, consider this: The average satisfaction rating among mail-order PC buyers surveyed is an impressive 7.94 (on a scale of 1 to 9), and on average, 80 percent of the respondents with a hardware problem said they would still buy another PC from the

Service Options at a Glance

● = Yes
○ = No

Manufacturer	Warranty (months)	On-site service less than $100	Free on-site service	TECHNICAL SUPPORT: Toll free	Daily hours	Weekend support	BBS	Fax
COMPUADD	12	●	○	●	24	●	●	●
DELL	12	●	●	●	18	●	●	●
FASTMICRO	12	●	●	●	9	●	●	●
GATEWAY	12	●	●	●	18	●	●	●
INSIGHT	12	○	○	●	14	●	○	●
NORTHGATE	12	●	●	●	24	●	●	●
ZEOS	12	●	○	●	24	●	●	●

SURVEY REPORT

Who's Tops in Service?

Source: All data from July 1992 PC World call-in survey. Satisfaction ratings, incidence of hardware problems, and DOA rates based on all respondents. All other data based on respondents with hardware problems only.

PC Repairs: How Long Do They Really Take?

Manufacturer	Claimed turn-around time (hours)[1]	Actual turnaround time (days)[2]
COMPUADD	72[3]	6.2
DELL	n/a	5.5
FASTMICRO	48	12.8
GATEWAY	n/a	9.4
INSIGHT	48[3]	10.2
NORTHGATE	72	9
ZEOS	48[3]	5.6

[1] Reflects the number of hours vendor had the hardware, not actual turnaround time to customer. Based on data supplied by company to PC World.
[2] Based on data supplied by respondents to 1992 PC World Survey on Service and Support.
[3] Typical, but not guaranteed.

same manufacturer, indicating that the quality of the service compensated for the problems encountered. Further, in a September 1991 survey of 100 users each of Compaq, IBM, Dell, and Gateway systems (see "Rate Your Satisfaction," December 1991), the mail-order customers were markedly more satisfied than their counterparts who bought so-called name-brand systems. Ninety-four percent of the Dell customers and 91 percent of the Gateway customers said they would buy their PC again. That compares with 74 percent of the Compaq customers and 79 percent of the IBM customers who said that they would make the same choice.

To further compare the experiences of PC owners who bought direct from the manufacturer with those who bought through the retail channel, we conducted a second telephone survey, this time of 259 randomly selected *PC World* readers who had purchased a PC within the last two years. We found no significant difference in the hardware problem rate between those who bought their PC direct and those who went through a retailer. Thirty-eight percent of the direct buyers had a problem in the first two years, compared to 40 percent of the nondirect buyers.

We did see a difference in the dead-on-arrival (DOA) rate for hardware components. Nondirect buyers had an average component DOA rate of 7 percent, roughly half that of direct buyers, who reported a component DOA rate of 15 percent. The higher DOA rate for PCs bought direct is to be expected, given the inevitable hazards of shipping PCs through the mail. The surprisingly high DOA rate for PCs not bought direct could reflect the increasing number of "prepackaged" systems sold through discount stores.

Seven companies were cited often enough by respondents to our call-in survey that we can draw statistically supportable conclusions about them. Of the big seven, Dell gets the highest composite score for reliability and the quality of its service and support. But Zeos and Gateway, which each score highest on certain key questions, follow closely. In the next group come CompuAdd, Insight, and Northgate. These companies were rated reliable by their customers, but less so than their larger competitors. FastMicro, the final company in the top seven, is in a class by itself. It rates lower than any other company for most of the subjective questions put to customers regarding reliability, service, and satisfaction, even though some of the firm's objective scores, such as the overall rate of component failure, are better than those of other companies. According to FastMicro president Joe Lackey, the company has taken several steps since the survey was conducted to improve its customer service, including adding new staff and installing a toll-free customer service line.

More detailed analysis of each of our top seven companies follows.

CompuAdd

Overall satisfaction: 7.5
Component DOA rate: 9.8%
Hardware problem in the first two years: 49%
Average repair time: 6.2 days
Would buy again despite problem: 70%

Although CompuAdd's score hovers around average for overall user satisfaction, the company gets widely divergent scores across a range of key reliability indicators.

The company's DOA rate for single components is the second lowest in this survey—only Dell's is better. And its 6.2-day average turnaround on repairs gives it the third best rating, after Dell and Zeos.

However, components in CompuAdd systems have the highest repeat failure rate—27 percent compared with an average of 16.5 percent. And the company received one of the lowest overall reliability ratings in this report.

The average satisfaction rating among mail-order PC buyers surveyed is an impressive 7.94 on a scale of 1 to 9.

While the failure rate on monitors shipped with CompuAdd systems is a low 4 percent, compared with an average of 15 percent, floppy drives failed at a much higher than average rate.

CompuAdd Corp., 12303 Technology Blvd., Austin, TX 78727, 800/627-1967

Dell Computer Corporation

Overall satisfaction: 7.9
Component DOA rate: 9.1%
Hardware problem in the first two years: 36%
Average repair time: 5.5 days
Would buy again despite problem: 87%

Although only 5 percent of our respondents say they bought a computer from Dell in the last two years (third behind Gateway and Zeos), a full 38 percent of this group bought their Dell computer for work—that's well above the surveywide average of 20 percent. Clearly, Dell's reputation for quality has earned it the confidence of businesses, while many of its competitors have yet to break into this market.

Dell owners report the lowest incidence of problems and the lowest DOA component rate among vendors in this survey. In addition, Dell is the quickest to repair problem units—with an average turnaround of roughly 5.5 days. No doubt those impressive statistics help account for the 87 percent of Dell customers who say they would buy from Dell again despite any problems.

Although Dell is one of the few companies in this report to design and manufacture many of the components included in its systems, the failure rate for individual components is no better—or worse—than the average in virtually every category.

Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78727, 800/289-3355

FastMicro

Overall satisfaction: 7.4
Component DOA rate: 16.7%
Hardware problem in the first two years: 38%
Average repair time: 12.8 days
Would buy again despite problem: 56%

It's clear from our survey that price isn't everything. Although FastMicro offers some of the lowest prices of any of the companies in this report, when we asked respondents how much they thought they saved by buying direct, FastMicro customers responded with some of the lowest numbers. On average, they estimate a savings of only $526. That compares with an average savings estimate of $987 for Dell customers and $1090 for Gateway customers, even though FastMicro systems are considerably less expensive. What explains this? FastMicro scored last in many of the objective service-and-support ratings. This poor record may have prompted many customers to recalculate their savings estimates.

Not all the FastMicro news is bad. It has one of the lowest incidences of hardware problems—second only to Dell in this category. And motherboards in FastMicro systems are half as likely to fail as the average system in this survey.

But the stats go down from there. FastMicro units have one of the highest DOA rates for components. Owners of Fast Micro computers report a failure rate on hard disk controllers that is more than twice the average across all companies in our survey and three times as many mouse failures as those reported for competitors' systems.

Whether they experienced problems with their unit or not, FastMicro customers report the lowest level of satisfaction and give the company the lowest reliability rating. The company also takes longer to repair or replace damaged items than any other firm in this report (12.8 days compared with an average of 8.4 days). Given these dismal statistics, it's not surprising that the company also has the lowest number of customers who would buy from it again.

FastMicro, 4405 E. Baseline Rd., Phoenix, AZ 85044, 800/821-9000

A Look Behind the Numbers

Surveying people who've bought PCs by mail presents a formidable challenge. Though the direct channel has grown rapidly in recent years, the number of PCs purchased through mail order or directly from the manufacturer is still a relatively small percentage of the installed base of PCs in the country. Market researcher International Data Corporation estimates that direct-channel vendors such as Gateway, Zeos, Dell, and others account for no more than 9 to 10 percent of all personal computers sold each year. For smaller mail-order companies, and particularly for newer ones, market share as a percentage of installed PCs may be tiny.

Consequently, conventional surveys typically fail to capture large enough raw samples of mail-order PC buyers to make statistically valid analysis possible. A random mail or phone survey of *PC World* readers, for example, would ordinarily result in usable sample sizes for no more than two or three of the largest mail-order companies.

How the Survey Worked

The survey methodology used to gather the data for this article was specifically designed to capture information for as large a number of mail-order vendors as possible. In a full-page ad in the July 1992 issue, *PC World* asked readers to call a toll-free number if they had purchased a PC by mail any time in the past two years. Respondents used touch-tone phones to complete an interactive phone survey lasting about five minutes. Our survey was conducted over a period of six weeks, from June 15 to July 27, 1992. In all, 4063 people called our survey line offering information on 432 companies.

In a self-selecting sample such as ours, you'd expect the majority of respondents to be people with strong opinions—good or bad—about their recent buying experience. We took several steps to broaden the population of respondents: We encouraged people to respond whether or not they had a problem, all respondents were eligible to win a 486 computer, and we conducted the survey on a toll-free line.

Because this survey is not based on a true random sample of mail-order PC owners, overall averages and percentages are not necessarily projectable to all mail-order PCs. It's also possible that a disproportionate number of disgruntled buyers called our survey line, degrading the reliability figures for the firms profiled. As a check on these numbers, we conducted a follow-up phone survey of 259 randomly selected *PC World* readers who had purchased a computer within the last two years. Respondents from that survey reported virtually identical hardware problem rates.

We have included data on only the seven companies that were cited frequently enough (at least 50 times) to make the information statistically significant. And while the overall number of failures may be inflated slightly, the relative rankings among these seven companies are valid and provide a clear differentiation among the top direct-sales vendors.

—Roberta Furger and Thomas Gewecke

The Top Five Hardware Problems

Motherboard	20 percent
Hard disk	16 percent
Monitor	15 percent
Floppy drive	8 percent
Hard disk controller	7 percent

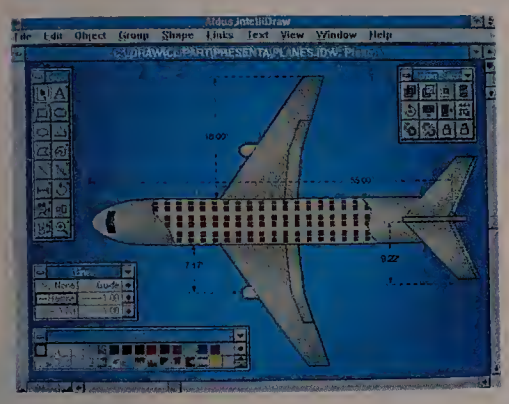
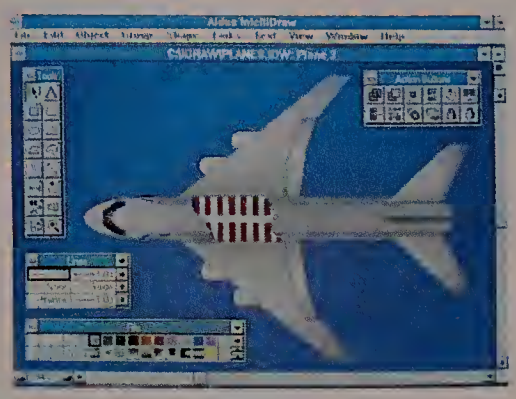
On average, respondents to our survey experienced their first hardware problem within the first five months of owning their mail-order PC. Motherboard failures were cited most frequently, followed closely by hard disk and monitor problems.

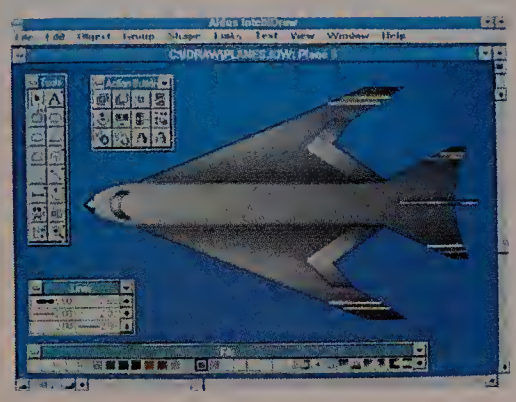
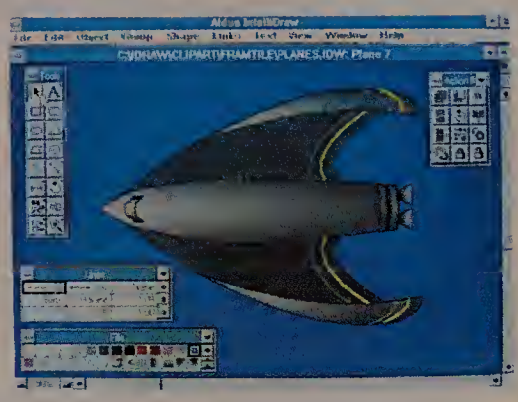
Gateway

Overall satisfaction: 8.2
Component DOA rate: 11.4%
Hardware problem in the first two years: 41%
Average repair time: 9.4 days
Would buy again despite problem: 89%

A whopping 27 percent of our respondents bought a Gateway system in the last two years—nearly three times more than any of its competitors. And according to our survey,

HOW TO CHANGE PLANES USING ONLY ONE FINGER.

Or, for that matter, a lot of other things. In fact, with Aldus® IntelliDraw™— for Macintosh and Windows — whatever you draw can easily be changed with a couple clicks of the mouse. (Not to mention how easy it is to draw in the first place.)

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With the Symmetrigon you simply draw one side of an object and the other side (or sides) are drawn automatically. On other programs, you'd have to draw each side one step at a time.

As for the Connectigon, it lets you change dimensions and perspective almost instantly (see the plane illustrations, here). Again, using other drawing packages, such modifications would be laborious at best.

And of course, that's only two of the 43. With IntelliDraw, you also get to take advantage of things like alignment guidelines and alignment frames (which automatically align and maintain spacing of multiple objects even if you decide to rearrange, add, or subtract objects in your drawing), master objects (which save a ton of time by letting you change multiple cloned objects simply by changing the one master item), and, as they say, much, much more.

Which logically leads to the following conclusion: what you really need is a free copy of our demonstration video. So call 1-800-685-4195.

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they're happy with the choice.

Gateway earns the highest satisfaction rating of any company in this report. Similarly, more Gateway customers say their computer performed according to their expectations. Gateway also ties with Zeos and Dell for having the most customers who would buy another system from the firm despite any hardware problems.

As with Dell, the Gateway component failure rates hover around the average. Gateway's turnaround time on repairs—an average of 9.4 days—is only slightly longer than the average, but it's considerably longer than that of competitors Dell and Zeos, each of which took care of problems in just under 6 days.

How do we explain the enormous number of responses we received for this one manufacturer? Price is obviously a big part of it: Buyers say they saved an average of nearly $1100 by purchasing their computer from Gateway. But it's the good service and support—combined with exceptional prices—that seems to be winning Gateway so many customers.

Gateway 2000, 610 Gateway Dr., N. Sioux City, SD 57049, 800/523-2000

Insight

Overall satisfaction: 7.8
Component DOA rate: 23.5%
Hardware problem in the first two years: 44%
Average repair time: 10.2 days
Would buy again despite problem: 80%

Insight fares poorly in many of the objective ratings. But despite these problems, 80 percent of the Insight users said they would buy their PC again.

Insight has the highest component DOA

Technical Support: A Necessary Evil

No matter which mail-order system you purchase, sooner or later you'll have to turn to the manufacturer for technical support. The question is, will you get prompt, helpful service, or will you be left on hold waiting for "the next available technician"?

Overall, survey respondents were quite satisfied with the quality of their vendor's technical support staff, giving the service an average satisfaction rating of 4 on a 1 to 5 scale. Response times varied considerably, though, from one company to the next.

We interviewed several of the respondents to our survey to find out more about their experience with the manufacturer's technical support. Everyone cites support as a big consideration in selecting a computer. Many also note that you can't always judge the quality of the support simply by reviewing the range of service options offered by a company.

The Waiting Game

While several respondents feel that tech support staffs generally try to be courteous and helpful, manufacturers sometimes procrastinate in meeting a customer's needs or demands.

In general, customers' biggest gripe is that the manufacturer fails to provide them with everything they need once they've purchased the hardware. Joseph Marrone, a senior programmer analyst with Ciba-Geigy Pharmaceuticals in Summit, New Jersey, says that Northgate should "support customers better by providing a catalog where we can purchase aftermarket supplies at a discount." And even when a company promises special services, such as on-site repairs or 24-hour parts replacement, the reality may be different. Parts may take longer to arrive, and companies often enlist other options before dispatching a technician. Complains Amy Haber of Rennert Bilingual, a language school in Manhattan: "Zeos never offered me any on-site support. Do they really expect me to unscrew the back of the computer?"

When it came to getting a technician on the phone, our survey showed that Zeos kept people waiting the longest, while Northgate and Fast Micro answered calls in just under 7 minutes. Getting a solution, on the other hand, took much longer. In our follow-up calls, respondents often told us that it can take anywhere from a few hours to a full day to resolve a problem. If a part has to be replaced, it can take even longer.

Another common complaint: The hardware manufacturer blames the software, while the software vendor blames the hardware. "I hate having to argue with people over the phone," says retiree Albert Baldwin of Oceanside, California. "You need a lot of patience when a company won't own up to its mistakes."

High Stakes

The stakes are high for hardware vendors. Poor technical support will send customers scurrying to a new brand next time they buy, whereas satisfactory experiences produce loyal customers. Dave Lawrence, president of Ventura Micro, a software development and consulting firm in Oxnard, California, runs the five Dell 386 and 486 systems in his office 12 hours a day. Although he has bought a number of computers from other manufacturers in the past and admits that Dells cost more, he warns that "If the computer is a key component of your business, you don't want to futz with third-tier machines." Although Lawrence has called the company's tech support at least 30 times in the past few years with complicated systems-compatibility questions, he feels the quality of support is very good. "I've never had a problem with Dell," he notes.

—Bronwyn Fryer

Who Ya Gonna Call?

Manufacturer	Time on hold (minutes)[1]	Satisfaction rating[2]
COMPUADD	7	4.2
DELL	9	4.2
FASTMICRO	7	3.6
GATEWAY	20	4.1
INSIGHT	33	4
NORTHGATE	7	4.3
ZEOS	43	4.1

[1] Average time given by respondents who had used a company's technical support, rounded to the nearest whole number.
[2] Based on a scale of 1 to 5, with 5 being the highest rating.

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rate of any of the companies in our report. Customers also had to wait an average of 10.2 days to get their hardware problem corrected, according to our survey. That's the second slowest turnaround time in this report. Floppy drives and keyboards included with Insight systems were particularly problematic, failing at more than twice the average rate in both cases.

Insight Computers, 1912 W. 4th St., Tempe, AZ 85281, 800/755-9628

Northgate

Overall satisfaction: 7.7
Component DOA rate: 14.8%
Hardware problem in the first two years: 52%
Average repair time: 9 days
Would buy again despite problem: 68%

Northgate owners on average have had their systems 61 percent longer than most other respondents in our survey. They also use their computers 5 hours more each week than the average across all companies in our survey. Most of the reported problems, however, occurred within the first few months of ownership, indicating they weren't related to either frequency of use or length of ownership.

Although Northgate owners are satisfied with their computers, their experiences point to an inconsistent reliability and service record. For example, 52 percent of Northgate owners report some hardware problem; that's the worst record of the top seven companies in our survey. Nearly 15 percent of the Northgate owners who called in had a computer arrive with one or more components DOA.

Component reliability runs the gamut. Northgate monitors have the lowest failure rate in this report. But keyboards and power supplies shipped with Northgate units failed much more often than those included with other systems. Northgate also scores poorly in several objective ratings. It has the lowest "performed to expectations" rating and the second-lowest "buy again" rating. Northgate owners also consistently rated their hardware problems as very serious.

Northgate Computer Systems, 7075 Flying Cloud Dr., Eden Prairie, MN 55344, 800/548-1993

Zeos

Overall satisfaction: 8
Component DOA rate: 13.9%
Hardware problem in the first two years: 43%
Average repair time: 5.6 days
Would buy again despite problem: 85%

Respondents who bought a system from Zeos in the last two years are generally very satisfied with their purchase. It has one of the fastest repair turnarounds among mail-order companies. Zeos monitors were some of the most reliable, and owners reported a much lower than average failure rate.

Among the more subjective questions, Zeos consistently ranked high, earning top marks for overall reliability and for performing according to expectations.

Zeos Int'l, 530 5th Ave. NW, St. Paul, MN 55112, 800/423-5891

Roberta Furger and Bronwyn Fryer are associate editors for PC World. PC World *research manager Thomas Gewecke contributed to this report.* ■

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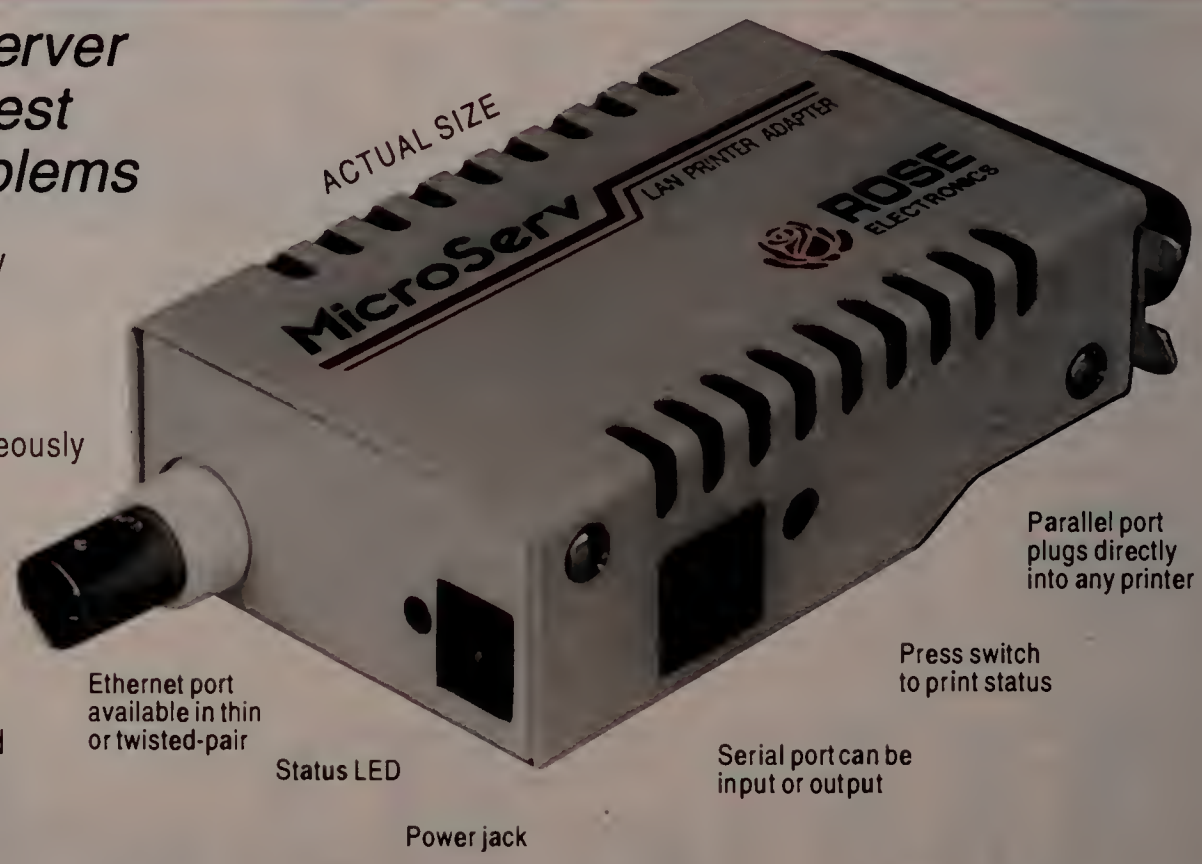

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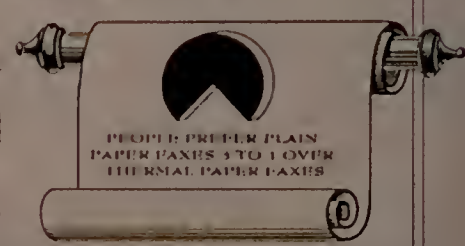

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Presentation Software Playoffs

HARVARD, FREELANCE, PERSUASION . . . TODAY'S FEATURE-RICH PRESENTERS ALL LOOK GREAT ON PAPER. TO FIND OUT WHICH YOU'D REALLY WANT TO USE, OUR PANEL OF TEN USERS PUT THE TOP SIX WINDOWS AND TOP FOUR DOS PACKAGES TO THE TEST.

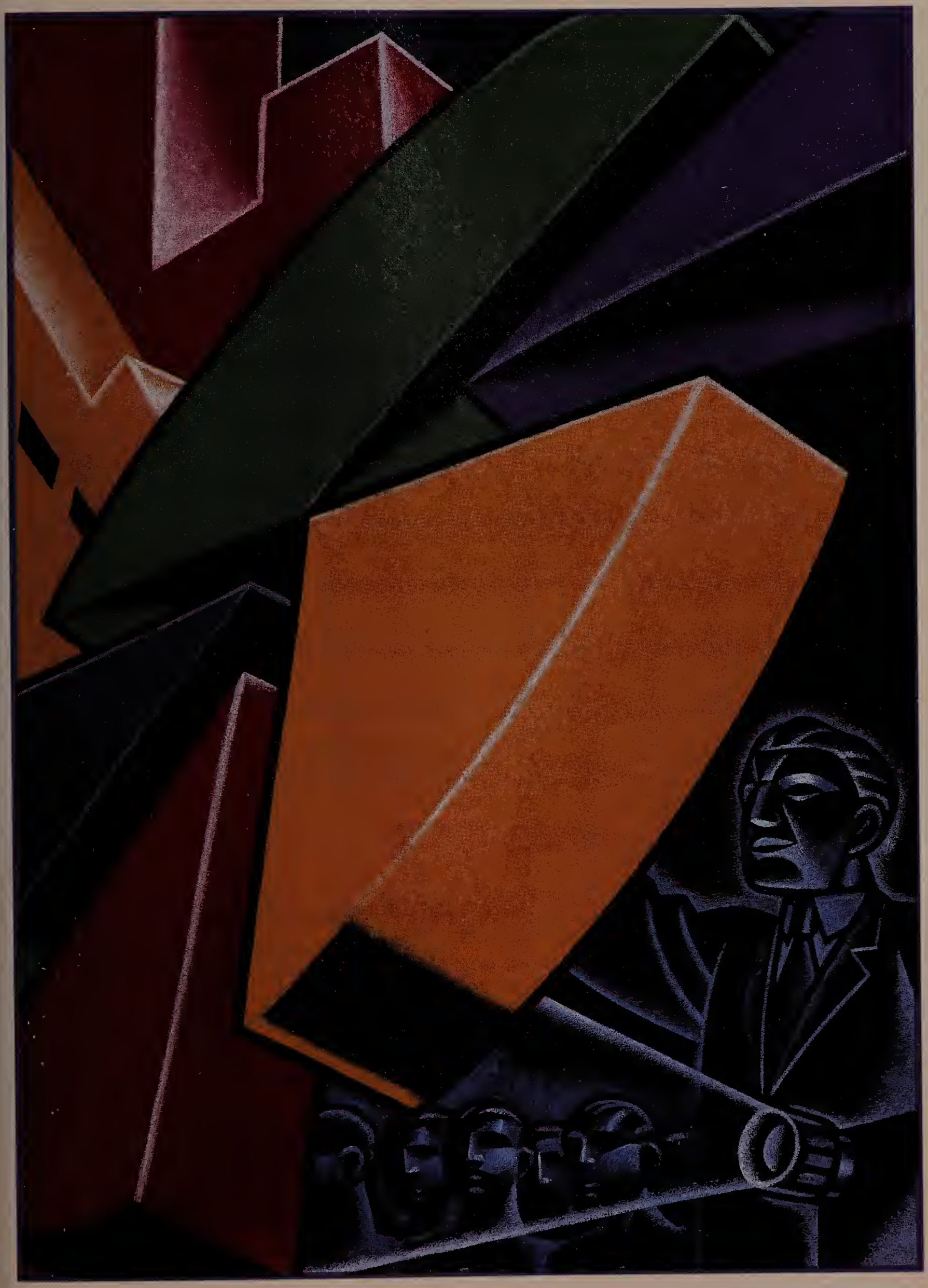
BY DEKE MCCLELLAND

When you have to make that monthly presentation, the boardroom becomes a trial by fire. And business fast-trackers rely on presentation graphics packages to help them emerge from the flames unscathed. You might like to use one of those fancy new software packages too, but let's face it: Your presentations tend to be major rush jobs. Who's got the time to learn a complex piece of software when a presentation is due tomorrow morning at nine?

PC World understands. So this year, to find presentation software that neophytes could learn and use immediately, we took a new approach. We put ten users in front of PCs and rotated them through the leading *Windows* and DOS-based presentation packages. Our requirements for picking the testers were simple: They had to be businesspeople and, so they wouldn't be biased toward any one program, they could not have used a PC presentation program before (see "The Software Rating Game"). Their experiences, combined with hands-on testing, will point you to software you can use right off the bat.

Our shoot-out yielded two clear winners: in the DOS division, longtime standout *Harvard Graphics*, and in the *Windows* division, *Freelance Graphics for Windows*. Our panel members were impressed by how easy and quick it was to create colorful and engaging presentations with both products. In fact, if our hands-on tests are any

DOUGLAS FRASER



indication, ease of use among presentation programs is at an all-time high. This is a great time finally to make the commitment to business presentation graphics on the PC.

How We Did It

To evaluate the packages, we started with "compulsory exercises," rating each package based on its basic features (program A provides the best thingamajig; program B is deficient in the doohickey department, and so on). These compulsories accounted for 60 percent of the overall total. In the highly competitive *Windows* division, Microsoft's *PowerPoint* and Aldus's *Persuasion*, the two programs with the largest and most comprehensive supply of features, were in the lead after the first round. In the DOS division, competition was more one-sided. Longtime favorite *Harvard Graphics* was head and shoulders above the others in pure functionality, snagging 46 points out of a possible 60.

Then the real battle began. We left the other 40 percent of the tally—ease of learning and ease of use—in the hands of our guest reviewers. In one room, six *Windows* warriors spent a grueling day cycling through four packages apiece. In a separate room, four DOS users sweated over the four competing programs in that field.

As it turned out, the panelists' votes changed everything. Two *Windows* entries that hadn't even existed when we ran our November 1991 review—*Harvard Graphics for Windows* and *Freelance Graphics for Windows*—garnered enough support to overtake *PowerPoint* and *Persuasion* and reach the final round. In the finals, *Freelance* nosed out *Harvard*, gaining five bonus points, which gave it enough points to win our recommendation as Best Buy in the *Windows* presentation graphics category.

On the DOS side, our testers merely padded *Harvard*'s already imposing lead, unanimously voting it the easiest to learn and use. Most impressive, despite the inherent advantage that *Windows* provides to graphics programs, the DOS version of *Harvard Graphics* received virtually the same number of points as *Harvard Graphics for Windows* and only three points less than Best Buy *Freelance for Windows*. The result is a Best Buy for DOS that runs under 640K of RAM and requires a significantly less sophisticated system than a similarly capable *Windows* package.

Can I Live Without 'Em?

If the thought of learning yet another piece of software is just too much to bear, you could get by using a program you already own. Plenty of folks make do with a word processor. Cliff Lawson, one of our guest testers, was one of those people, formerly creating all his overheads with *WordPerfect*. But after working with *Harvard Graphics*, he says he'll never go back.

The latest version of top-notch drawing program *CorelDraw* provides an even better presentation solution than a word processor. It ships with an independent utility called *CorelShow* that lets you assemble a sequence of charts and graphics created in other programs and play them back on screen. And if your line of work involves more number crunching than graphics, Borland's *Quattro Pro 4.0* and *Quattro Pro for Windows* provide an outstanding collection of charting capabilities and even allow you to integrate transition effects into your screen shows.

Both *CorelShow* and *Quattro Pro* provide a slide sorter for reordering slides within your presentation. But neither program provides an outliner, a separate view for publishing audience handouts, or sufficient editing and formatting capabilities to automate fully the creation of bulleted lists, organization charts, and other popular kinds of text-based slides. So use 'em if you got 'em; otherwise, consider a dedicated presentation program, which packs more capabilities into a tidier package. On the next pages you'll find our reviews of the six top *Windows* contenders, followed by appraisals of the DOS packages that survived our torture tests.

Best Buys

***Freelance Graphics for Windows 1.0* captured the crown in the highly competitive *Windows* division when our panel of testers dubbed it the easiest to learn and use. In the DOS division, *Harvard Graphics 3.01* was the overwhelming champion, with top marks in both features and usability.**

Freelance Graphics for Windows

Harvard Graphics

Aldus Persuasion 2.1

Pros: Strong organizational skills, well-documented templates and color schemes, versatile build feature

Cons: No context-sensitive help, little hand-holding for inexperienced users

WINDOWS It's been a long time since its last major upgrade, yet *Persuasion* still proved to be a top-notch performer, with organizational capabilities surpassed only by *Hollywood* and *PowerPoint*.

Persuasion is the only program that lets you send a detail of a chart to a different layer to build up the chart in a screen show.

The Software Rating Game

In our monthly reviews, *PC World* authors put software through its paces. We use the programs for several weeks, pronouncing judgments on menu structure, tools, documentation and on-line help, and so on. Generally speaking, the system works remarkably well, producing reliable and defensible results.

Well, there is one problem. How can PC professionals who routinely install more software each month than many users will see in a lifetime fairly evaluate how easy a program is to learn and use? They can't. And for presentation software, which many businesspeople use only once a month, ease of learning and ease of use are key.

So this time we decided *you* should judge the software. We combed *PC World*'s subscriber lists to find our panelists. To make the tests fair, we needed people who gave presentations but had never before used a presentation program.

An Impressive Bunch

We came up with a collection of people from various professional walks of life: a telecommunications manager for a major hotel, a marketing coordinator for a manufacturing and distribution firm, a senior account coordinator for an insurance company, a project manager for the Bank of California . . . frankly, when the day rolled around to meet our testers, we were pretty intimidated. So we flew in someone who really knew his stuff: Kevin Draz, an application engineer at Oregon-based Tektronix, manufacturer of some of the best color printers around. Kevin brought a Tektronix Phaser II PXi color printer so we could print our panelists' presentations. Together with editors Steve Fox and Christina Wood, we convened at the computer training facilities of San Francisco–based Abacus to begin our testing.

The Scoring Scheme

Before our panel arrived, we loaded the software onto ten identical machines—25-MHz 386s with 8MB of RAM. We divided the group into *Windows* and DOS users and set them up in separate rooms. We explained our scoring system to the group: 60 percent of any product's rating would be based on *PC World*'s standard suite of features and functionality tests, which we had performed earlier. For that 60 percent, organization would account for 15 percent; charting, 17 percent; drawing and text, 5 percent; graphics and multimedia, 7 percent; production, 10 percent; service and support, 5 percent; and price, just 1 percent (all ten products have nearly identical prices). That left a hefty 40 percent for our panel, who would determine scores by making presentations on four different packages.

We asked our panelists to pretend they were account executives for ManMade Foods, a producer of synthetic edibles. They were told to prepare a seven-page presentation to pitch their product line to a large grocery chain. We gave them rough guidelines and some spreadsheet files to import; other than that, they were free to experiment. And experiment they did. In fact, you can see some of their handiwork on the screens that appear throughout this review.

In the *Windows* division, we divided the six programs down the middle, with *PowerPoint, Harvard Graphics for Windows*, and *Hollywood* in Group 1 and *Freelance Graphics for Windows, Persuasion*, and *Charisma* rounding out Group 2. Each user tried out all three programs in his or her group for an hour and a half apiece. After they'd used all three packages, we instructed the testers—much as a judge instructs a jury—to rate each program on two counts: ease of learning and ease of use. Secret ballots all around, no talking to your neighbor, ratings on a scale of 1 to 5.

And the Winners Are . . .

We came up with two unanimous winners: Software Publishing's *Harvard Graphics for Windows* in Group 1 and Lotus's *Freelance Graphics for Windows* in Group 2. The two programs then met in a final round. All three users from Group 1—*Harvard* veterans by now—got to check out *Freelance*, while Group 2—the *Freelancers*—worked on *Harvard*. Ninety minutes later, a second vote elected *Freelance* the winner. Though it had ranked only fourth in functionality, *Freelance*'s high ease-of-learning/ease-of-use scores proved enough to put it over the top and earn it our Best Buy for *Windows*.

The DOS division proved less complicated. We were evaluating just four packages, so we skipped the semifinal round and had our four testers exercise each of the products in rotation. The winner by a landslide: *Harvard Graphics 3.01*. Also capturing the earlier features and functionality tests, *Harvard* easily prevailed as the Best Buy for a DOS presentation graphics package.

Real Users Speak: Freelance for Windows, Harvard Do It Best

	Windows Programs						DOS Programs			
			BEST BUY						BEST BUY	
	Aldus Persuasion 2.1	Charisma 2.1	Freelance Graphics for Windows 1.0	Harvard Graphics for Windows 1.01	Hollywood 1.0v2	Microsoft PowerPoint 3.0	DrawPerfect 1.1	Freelance Graphics for DOS 4.0	Harvard Graphics 3.01	Presentation Express II 2.0
Ease of learning	11	10	14	16	10	12	7	5	15	10
Ease of use	12	11	23 [2]	16	9	13	11	6	18	14
Total [1]	23	21	37	32	19	25	18	11	33	24

[1] Out of a possible 40 points; all scores rounded up to the nearest whole number. [2] Includes 5-point second-round bonus.

After entering titles and text into the outline view, you apply a template to define the appearance of your presentation automatically. Each template contains several formats to control the placement of text and graphics within different kinds of charts. If you like the "look" of a template but you're not happy with the colors, you can apply a new color scheme at will.

When it comes to incorporating builds into run-time screen shows, *Persuasion* can't be beat. Each slide contains multiple layers, and each layer can be displayed incrementally in a build. So not only can you fade in bulleted items in a screen show, as in other programs, you also can fade in images, labels, and other special elements by placing them on their own layers, a function matched only by *Hollywood*. You can even place different series within a single chart on different layers—something *Hollywood* can't do—so that bars or lines representing different portions of your company can fade independently.

Persuasion's documentation is outstanding. A separate Desktop Reference contains full-color screen shots of every one of its templates and explains how to create fancy charts with its graphing tools. Unfortunately, our first-time users, who didn't feel like burrowing through documentation, preferred *Freelance* and *Harvard Graphics*, two programs that acclimatize novices by asking them questions and pointing them in a specific direction. *Persuasion* left them to figure out its tools and commands on their own—a problem, considering it doesn't offer context-sensitive help.

Aldus Persuasion 2.1, Aldus; 206/628-2320, 206/622-5500. List price: $495. Reader service no. 725

Charisma 2.1

Pros: Excellent drawing and charting tools, OLE server
Cons: Weak organizational capabilities, cannot create run-time screen shows

WINDOWS As panel member Robert Smithton noted, "I was immediately able to start drawing all over the place." That's because *Charisma* is more of a drawing and charting program than a presentation application. It lacks an outliner, a master slide layer, a slide sorter, and a spelling checker. In short, *Charisma* fails to provide any of the organizational capabilities we've come to expect from a presentation program. Our *Windows* panel picked up on these omissions right from the start, hitting *Charisma* with some of the lowest ease-of-use and ease-of-learning scores of the bunch.

While a bust for straight-ahead business presenters like our guest reviewers, *Charisma*'s heavy emphasis on drawing tools may prove a boon to graphics enthusiasts looking to make an entrance into the presentation arena. *Charisma* also provides an extensive variety of charting functions. If its documentation were more specific in explaining how to create chart variations, such as percentage charts and horizontal paired charts, it might surpass charting king *Harvard Graphics*. Documentation, unfortunately, is not its strong suit. However, its charting capabilities, together with its solid support for DDE and its capability to share charts via OLE under *Windows 3.1*, make *Charisma* an ideal package for preparing charts and drawings to be exported into more worthy presentation packages.

At a substantially reduced price, *Charisma* would be a tempting addition to the ambitious presenter's software library. At its current $495 cost, however, you can't overlook the program's complete inability to manage slides and ideas, the number one responsibility of any presentation graphics package.

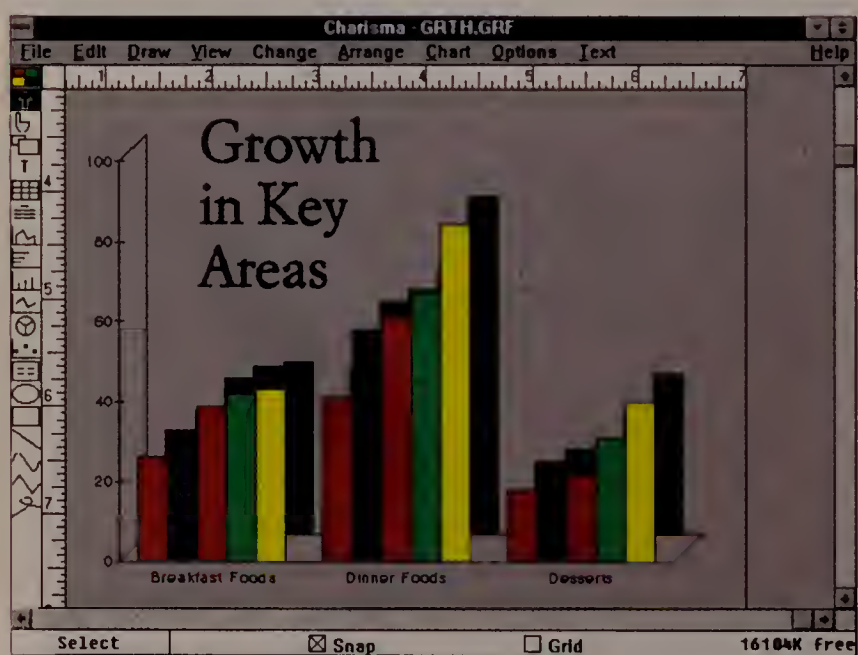
Charisma 2.1, Micrografx; 800/733-3729 ext. 5050, 214/234-1769, 214/234-2410 (fax). List price: $495. Reader service no. 726

Freelance Graphics for Windows 1.0

Pros: Extremely intuitive interface, matches worksheet to chart type, lets you undo ten consecutive operations
Cons: No handout or speaker-note view, poor line spacing control, no builds

WINDOWS Lotus wins the award for irony. Not satisfied to create the most ornery presentation package for DOS (see the review in this article), they turn around and release the friendliest, most straightforward of the six *Windows* applications. In the words of tester Jack Nichols, it is "hands down the easiest program to use."

On the face of it, *Freelance for Windows* resembles a simplified version of *Persuasion:* It offers similar outliner and slide-sorter metaphors. And its templates provide multiple slide formats, just as in *Persuasion*. But *Freelance* offers a unique world of convenience



Charisma's charting tools yield some unusual results, such as this 3-D column chart that uses drop shadows instead of depth lines.

You can customize Freelance Graphics for Windows' interface by adding and deleting palette icons to suit your personal style.

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Circle 107 on reader service card

features. For one, you can edit template elements to make global changes to your slides. In *Persuasion*, you can add elements to the master slide layer and manipulate placeholders, but you can't edit the background portion of the template. To cut down on the time required to locate and choose menu commands, *Freelance* provides a palette of immediately comprehensible icons that duplicate commands. You can customize the palette by adding and subtracting icons; *Freelance for Windows* provides an icon for nearly every one of its functions.

Our panel was particularly enamored with the way *Freelance* walked them through major steps toward creating a presentation. When you create a new slide, it requests that you select a template format. When you create a chart, the program asks which kind of chart you want to create, then shortens its worksheet to fit the specialized requirements of that chart type. It even shows you the colors that will be assigned to each data series and lets you edit them from the worksheet. To add text and images to a slide, just point and click; *Freelance* does much of the rest of the work for you. Another panel favorite: Inserting clip art is an entirely point-and-click affair.

Although some members of our panel complained about its annoyingly slow on-line tutorial, *Freelance for Windows* was a real hit all around, receiving such accolades as "A complete no-brainer," and "So simple, I almost fell over!" Though two of our *Windows* testers maintained a preference for *Harvard Graphics* after comparing the programs head-to-head, *Freelance for Windows*' remarkable combination of essential features and unfaltering straightforwardness earns it our highest recommendation.

Freelance Graphics for Windows 1.0, Lotus Development; 800/343-5414, 617/577-8500 (fax). List price: $495. Reader service no. 727

Harvard Graphics for Windows 1.01

Pros: Intuitive interface, first-rate charting tools, best sound capabilities, interactive screen-show buttons
Cons: No OLE support, no line spacing control, manual build technique

WINDOWS Like its DOS cousin, *Harvard Graphics for Windows* greatly impressed our panel. Jamal Nasr, for instance, called it a "commonsense program," adding that he never needed to look in the manual. Connie Kozlowski went even further, calling it a "pleasure to use."

After ease of use, our testers generally cited *Harvard*'s impressive charting capabilities. When you first launch *Harvard* and request a new presentation, the program shows off its immense gallery of charting options, more comprehensive than anything you'll see in a competing *Windows* program. Like *Freelance for Windows*, *Harvard* customizes its worksheet to match the type of chart you select, but it doesn't provide the kind of visual aids you'll find in *Freelance*, nor does it allow you to change the color of a series from the worksheet. Still, our only real quibble is that *Harvard for Windows* fails to provide the data calculation functions that make its DOS counterpart such a dream for the professional user.

On the organizational front, *Harvard for Windows* beats its DOS equivalent handily, offering an outliner, slide sorter, and all the other amenities you expect from a *Windows* presenter. *Harvard* falls down, however, in the build department. You must copy elements

Harvard for Windows has a huge collection of clip-art images and lets you edit them in ways unmatched by other presentation programs.

to independent slides, then delete elements in the order that you want them to appear. In other words, *Harvard Graphics for Windows*' builds aren't builds at all.

Otherwise, *Harvard for Windows* measures up nicely for creating screen shows. Using its interactive buttons, you can create links to other slides in the show. For example, clicking button 1 might send you a supporting spreadsheet, clicking button 2 might send you back to slide 1, and so on, allowing viewers to navigate presentations as they wished. If your computer comes rigged with a soundboard and other fancy multimedia gear, *Harvard* goes all out to take advantage of it. Using the player utility, you can run scripts that control MIDI sound tracks while simultaneously playing WAV sounds in the foreground.

Our novice users never got deep enough into the program to find some of these more sophisticated functions. Their infatuation stemmed from its high usability: *Harvard* ranked a close second to *Freelance for Windows* in the hearts of our panel members. There were a few naysayers, however. Comparing it with *Freelance for Windows*, for instance, Robert Smithton said he "had to plug away to get anywhere." Another user expressed disappointment at *Harvard*'s lack of on-line tutorial. But in the end, *Harvard*'s reviews were positive. In the battle between *Harvard* and *Freelance*, the decision largely came down to matters of personal taste.

Harvard Graphics for Windows 1.01, Software Publishing; 408/986-8000. List price: $595. Reader service no. 728

Hollywood 1.0v2

Pros: Provides painting tools, various special effects
Cons: No OLE support, poor leading control, limited to 16 on-screen colors in foreground, inadequate documentation

WINDOWS. Our critics panned *Hollywood*, reserving particular criticism for its "badly organized" documentation and its "cumbersome" interface. Connie Kozlowski, for instance, told us she never got the hang of the program and had to "constantly consult the manual," which she found inadequate and badly indexed. If our panel members had been able to crack *Hollywood*'s confusing sur-

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Silicon Valley is a tough place to be these days. Major computer companies are laying off and smaller computer companies who are not prepared for the battle are closing up left and right. The first to go are those who refuse to provide their customers with the service they deserve and continue to use the least expensive components which can be found to maintain low prices.

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Although Hollywood can display smooth gradations in the background, it dithers all foreground colors, sometimes improperly.

face, they would have found a program that combines unusual graphics and special-effects capabilities with first-rate organizational functions. It even allows you to open multiple presentations at once for those occasions when you need to swap slides between shows. The program provides a range of drawing functions that you won't find this side of *Charisma*, including tools for drawing regular polygons and Bézier curves. It also offers some unusual surprises, including a free-form spray-paint tool for highlighting slides, as well as text on a curve and object beveling.

But features alone don't sell a program, which is why last year's Best Buy—virtually unchanged since its 1991 introduction—was trounced by newer or more recently revised programs. "I couldn't get the pie chart to work," wrote tester Jack Nichols, "even with the manual." Badly documented and strangely organized, *Hollywood*'s implementation defeats the purpose of many of its impressive capabilities.

Hollywood 1.0v2, Claris Corp.; 408/987-8227. List price: $499.
Reader service no. 729

Buying Smart: The Presenters' Shopping List

Picking a favorite presentation graphics package would be easier if the programs weren't so darn good. Check the shopping list that follows to determine what criteria are most important to you.

Organization

First look at how the program organizes the task of creating a presentation. The best packages provide outliners so you can rough out your presentation, then automatically build slide titles, bullet charts, and speaker notes from outline entries. Make sure the program maintains a dynamic link between the outliner and slide views, so that making a change to one entry will also affect the corresponding slide. A spelling checker and search-and-replace function are also helpful. A master slide is essential, because it allows you to position and relocate repeating elements on every slide in your show simultaneously.

Perhaps the most useful organizational time-saver is a global editing feature, which lets you apply predefined templates that automatically position graphic elements, format text charts, and color background items in one operation. Finally, see if the program provides a slide sorter so you can reorder your presentation by dragging a thumbnail view of any slide to a new location. This is also a good way to test dynamic links, since dragging a slide should likewise change the order of entries in the outliner.

Charting

At its heart, a presentation is a collection of charts. Word charts are by far the most popular, but data charts are also key. That's why every presentation program is part spreadsheet. You should be able to enter data directly into a worksheet window or just as easily import data that you've created in *1-2-3* or *Excel*. If you import data on a regular basis, check that the program can maintain live links between data saved to disk and the data represented in your charts. Under *Windows*, such programs employ Dynamic Data Exchange (DDE) protocol. Live linking is especially important when sharing data over a network. If a colleague three cubicles down makes a last-minute change to a single spreadsheet value, your presentation program needs to update your charts automatically.

If you're in the market for *Windows* software, look for a program that supports Object Linking and Embedding (OLE), which links imported data and graphics to their original applications. If the program is an OLE server, such as *Charisma*, you can export charts for use in other programs, including desktop-publishing applications like *PageMaker*. If the program is a client, such as *Persuasion*, you can double-click an imported range of data to launch the spreadsheet program, make the desired changes, and save the changes. Currently, *PowerPoint* is the only presenter that supports OLE as both server and client.

Any presentation graphics package will automatically take your data and generate vertical (column) and horizontal bar charts, line and filled-in area charts, and exploded pie charts. If you want to add some pizzazz to your graphics, make sure the program can add depth to bars and pies by creating three-dimensional effects. If you never know what kind of chart you'll be called on to create, look for a program that provides variety, including scatter charts, high/low/close charts, and specialized text slides such as tables and organizational charts. Scientific types will appreciate packages that provide analytical functions including logarithmic scaling and regression.

Drawing and Text

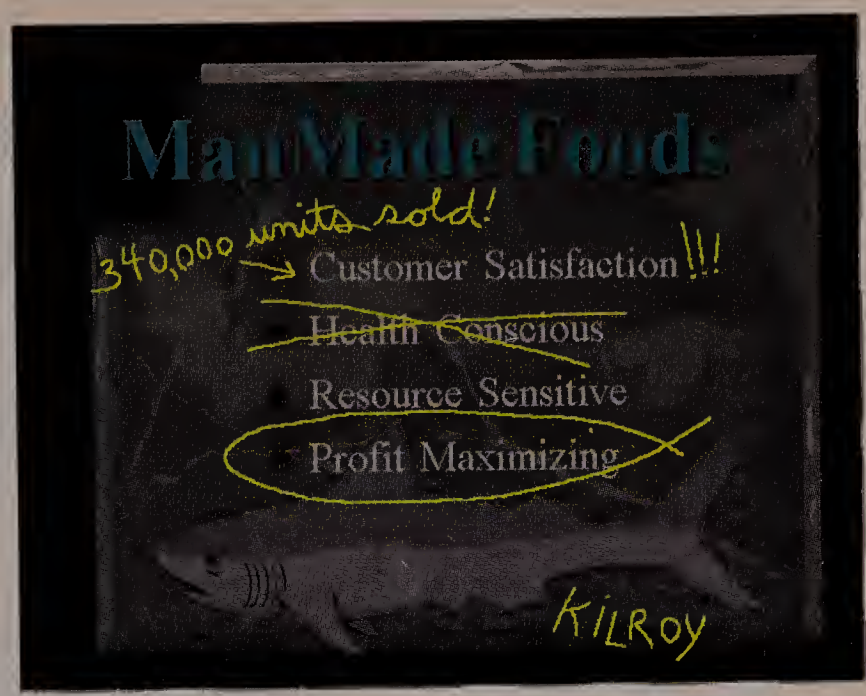
Not every image falls into a predefined charting format. You need the freedom to embellish slides with text and graphics. On rare occasions, you may even want to draw slides from scratch. A passable variety of drawing tools will let you create free-form objects such as polygons and curves. You'll also want to be able to manipulate drawn objects by scaling, rotating, and applying special effects. If your work involves schematic drawings or pictographs (charts made up of graphics), make sure you can align objects and organize them into groups. When creating descriptive text and labels, lead and paragraph spacing con-

Microsoft PowerPoint 3.0

Pros: OLE server and client, TrueType font embedding, flying bullets, can highlight portions of a slide during screen show
Cons: No tables or organizational charts, requires Windows 3.1

WINDOWS Our panel of novice presenters was probably not the ideal audience for *PowerPoint*. They liked it well enough but didn't have a compelling need for *PowerPoint*'s inexhaustible supply of bells and whistles and superb slide management. Panelist Jack Nichols best summarized the group's thoughts: "*PowerPoint* is obviously powerful, but it's complex for a first-time user to grasp."

For the presenter on the go, *PowerPoint* offers templates with thumbnail previews. If you're in it for the long haul, its speaker note and handout views come equipped with their own master layers. And if convenience is what you're after, you can drag-and-drop entries inside the outline editor to reorder slides just as you can drag-and-drop slides to reorder outline entries.



In Microsoft PowerPoint, you can emphasize items by drawing on a slide during a screen show.

trols are imperative. A manual kerning function, for changing the space between two letters within words, allows you to tweak the appearance of titles and other large-format text.

Graphics and Multimedia

To wow an audience, nothing works as well as sound and animation. Real high-end audio pyrotechnics are beyond the range of most business presentation programs, but a few, including *Harvard Graphics for Windows* and *PowerPoint*, will play an imported WAV sound. For that, you'll need to equip your computer with a soundboard.

Most presenters will have to satisfy themselves with visual effects. A build function lets you fade bullets on and off the screen within a single slide, an especially effective technique for highlighting points in a lecture. *PowerPoint* even allows you to "fly" bullets across the screen—the closest thing to animation any of these programs provide.

More down-to-earth graphics are also possible. Gradations and special designer backgrounds add flare to an otherwise uninspired chart. And look for a program that provides a nice variety of preset color schemes to assign colors automatically to text and background items.

Scalable typefaces you can display and print at virtually any size are a must if you're purchasing a DOS program. The issue is less critical with *Windows* programs because they all offer scalable fonts just by virtue of running under *Windows 3.1 (3.1* ships with 14 TrueType fonts). Nonetheless, additional scalable fonts are useful for adding variety to your presentations. *PowerPoint* includes 22 TrueType fonts, while *Persuasion* and *Freelance Graphics* bundle *Adobe Type Manager (ATM)*, which retails for $99. *ATM* lets you view and print any PostScript font, as well as providing 13 additional Adobe typefaces.

Production

If your company is bankrolling your efforts, you'll have sufficient funds to print images to 35mm slides. All programs provide a built-in communications module for uploading your files to a professional slide-making facility—Autographix, Magicorp, and others—via modem. If you have the equipment in house, you'll find that most packages bundle drivers to print to popular brands of plotters, imagesetters, and film recorders.

A tight budget, however, doesn't have to mean a sacrifice in quality. All the programs we tested will print remarkably impressive color overheads from a Tektronix or similarly equipped output device. Your local service bureau may provide color transparencies for $2 to $3 per page. And, of course, there's always the old standby: low-cost black-and-white transparencies from your laser printer. To tie everything together, your program should print handouts and speaker notes, with reduced versions of each slide in your show. Armed with these visual aids, your audience will be better able to follow your presentation.

Sounds, builds, flying bullets, and transition effects are available only if you use your PC for the final show. If the audience is large, you can play your show on a large-screen projection device (see "Color LCD Projection Panels"). If the audience is small, you can display your presentation directly on your monitor. A third option is to save your presentation to disk as a run-time screen show, which you can distribute on disk and play on any machine, whether or not it comes equipped with the original application. Of the ten contenders, only *Charisma* and *Presentation Express* can't produce run-time shows.

Service and Support

Even the best programs can at times leave you floundering for advice. Context-sensitive help means you can find information on a specific tool, command, or feature without navigating through a maze of on-line help options. Tech support for all these products rated high, hardly surprising considering our vendors include some of the world's largest and oldest software companies. We called each vendor three times, asked questions of varying technical complexity, and noted the timeliness and accuracy of their answers. We also factored in their support policies, such as hours, toll-free lines, and BBS and fax support.

PowerPoint blossoms when it comes to creating run-time screen shows. While its builds aren't as versatile as *Persuasion*'s, you can fade in bulleted items or shoot them in from off screen. If your slides contain imported color images, *PowerPoint* automatically optimizes the color palette for each slide, then animates the palettes when playing from one slide to the next to avoid screen flicker. *PowerPoint* is the only presenter that will embed TrueType fonts, so your words will display correctly even on a machine that lacks the fonts you used. Finally, to emphasize your words, you can write on a slide with your mouse while the screen show is in progress, much the way you write on an overhead with a felt-tip marker.

There's lots more where that came from. In fact, if it hadn't been for our ease-of-learning panel, *PowerPoint* might have walked away with our Best Buy. But our *Windows* testers saw it differently, reserving their top scores for *Harvard* and *Freelance*. Our recommendation is this: If you're new to presentation software, *Freelance Graphics for Windows* combines workmanlike functionality with unsurpassed straightforwardness. But if you're an experienced presenter looking for a package that provides the best in slide-making control plus a versatile interface that encourages creativity, *PowerPoint* is the software you've been waiting for. Just make sure you've upgraded to *Windows 3.1* before you send in your order.

Microsoft PowerPoint 3.0, Microsoft; 800/426-9400. List price: $495.

Reader service no. 730

DrawPerfect 1.1

Pros: Low memory requirements, on-screen kerning

Cons: Nonintuitive interface, lacks essential organizational capabilities, can't generate handouts or speaker notes

Our panel of users dredged up adjectives like "cumbersome," "nonintuitive," and even "nightmarish" to describe this presentation package from WordPerfect. The most positive reviewer said the program might be best suited to *WordPerfect* users because it shares many of the same keyboard equivalents.

On the Horizon

Companies that produce presentation packages share a basic philosophy: Upgrade or perish. Witness our two Best Buys, *Freelance Graphics for Windows* and *Harvard Graphics*, both of which have major revisions in the works. Our number two DOS presenter, *Presentation Express*, has a new version that came out a bit too late to evaluate. And in an attempt to get back in the race, low-rated *DrawPerfect* is also hopping on the upgrade bandwagon.

DrawPerfect Perfected

The most dramatic face-lift belongs to ugly duckling *DrawPerfect*, which emerges as *WordPerfect Presentations*, a swan capable of competing with *Harvard Graphics*. Both a DOS version, previewed in our September issue, and a *Windows* version should be available by the time you read this. The DOS incarnation, with a slick GUI that makes it look and feel remarkably *Windows*-like, features a customizable button bar and standardized menu commands, complete with <Alt>-*key* equivalents. *WordPerfect Presentations* overhauls the product's organizational capabilities, adding an integrated outliner, a slide sorter, master slides, auto-templates, and a spelling checker. If your computer comes equipped with a soundboard, you'll be able to add sounds or play music in the background using any of the over 100 MIDI sound clips. The upgrade even offers a full-color painting window chock-full of image-editing tools. The product still retails for $495; this time it's a good deal.

Harvard Goes Multimedia

Industry leader *Harvard Graphics* is also expanding toward multimedia and interactivity. The new *Harvard* plays WAV sounds and MIDI files that can add music and voice annotation to a screen show. In terms of interactivity, you can add a button that launches another DOS application in a screen show. The $595 upgrade speeds screen shows by loading each slide into memory before displaying it on screen. *Harvard Graphics 3.01* users can upgrade to version 3.05 for a nominal shipping fee; version 2.3 users can make the move up for $89.

Quick Fix for Express

Presentation Express II 2.0 was a relatively recent revision when we prepared this review. In a surprise move, BPS plans to get version 2.1 in the stores by the time you read this. This quick upgrade features scalable text from 4 to 256 points, snap-to grids that align and manipulate objects on the drawing board, additional screen-show transitional effects, and a much-needed run-time screen-show module. In addition, *Presentation Express II 2.1* has beefed up its already imposing list of supported output devices. If you'd like to evaluate the new *Presentation Express*, you can download it from PC World Online, from the "Featured in November" folder.

Beefed-Up Freelance

As if the current version weren't easy enough to use, *Freelance Graphics for Windows 2.0* will feature a new start-up sequence, a new master-slide layout, direct text-editing capabilities, an icon that transforms a color display to black and white, and help from any dialog box. Currently weak on support for OLE, *Freelance 2.0* will offer full support as both client and server. And so you won't have to call Autographix or Magicorp and beg for a communications module, version 2.0 will bundle everything you need to upload slides for remote printing. During screen shows, you'll be able to doodle on screen to emphasize points (a capability shared by *PowerPoint* and the upcoming *WordPerfect Presentations*) and branch to other *Windows* applications.

And while a Lotus representative told us it was too early to share details, you can expect a future *Freelance Graphics for DOS* that integrates the usability breakthroughs championed by its *Windows* counterpart. Lotus plans to announce the new product at the COMDEX Fall exposition this month and should ship it early in 1993.

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PC MAGAZIN
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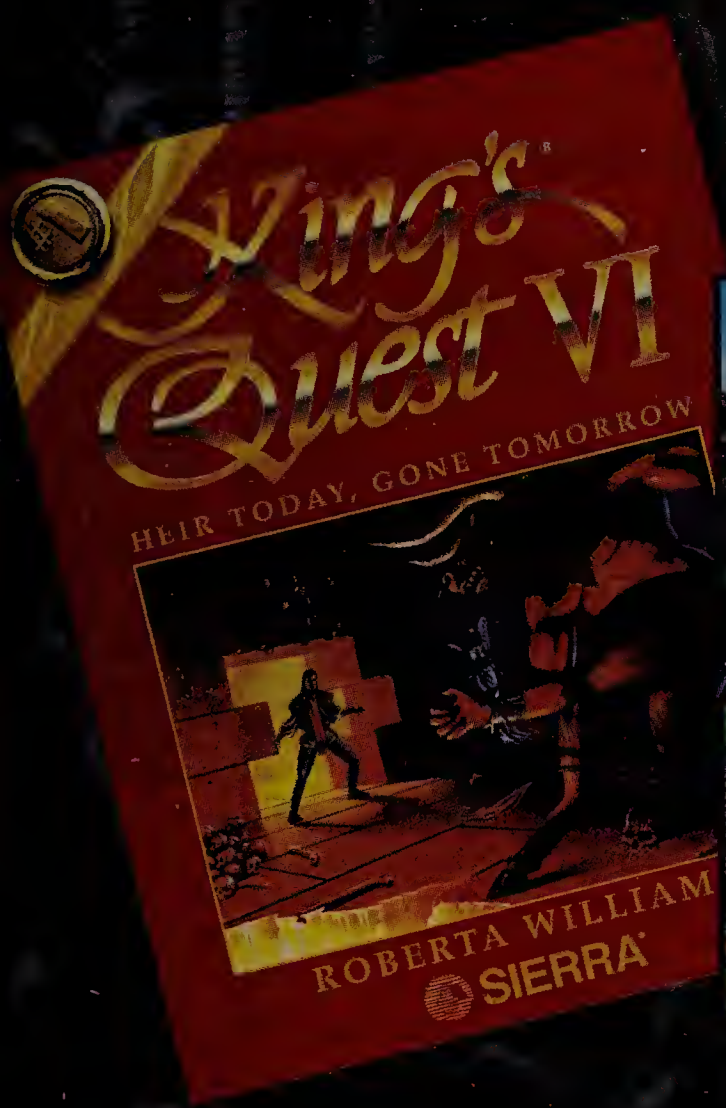

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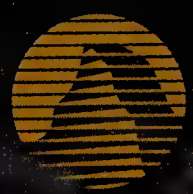

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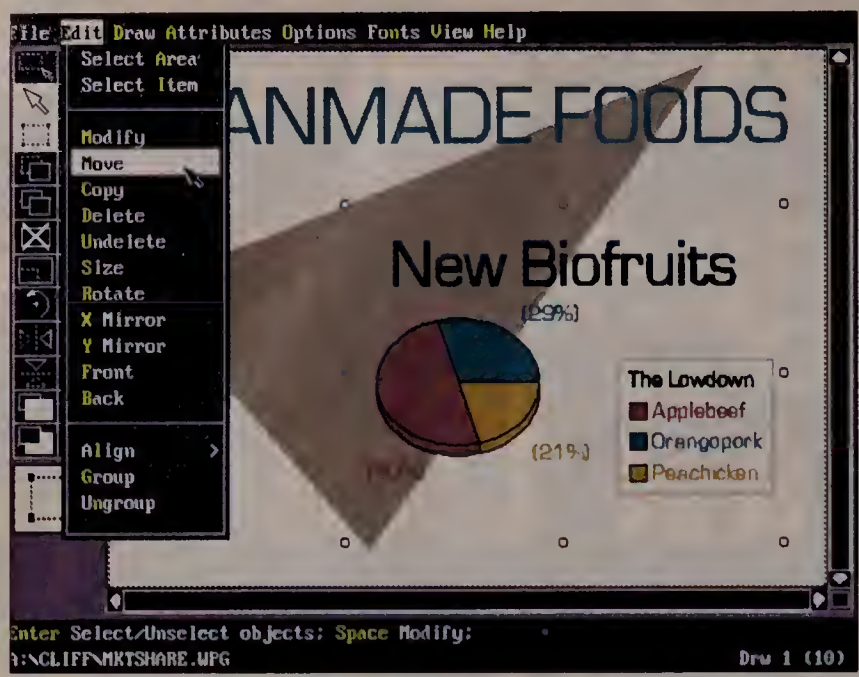

DrawPerfect 1.1 combines antiquated drawing metaphors with excessively jagged on-screen type, even by DOS standards.

Like *Charisma*, *DrawPerfect* lacks most of the organizational capabilities on the standard shopping list. But even judging it on drawing and charting merits alone, our testers were thoroughly unimpressed—and often confused. That's because for anyone accustomed to *CorelDraw*, *PageMaker*, or some other mainstream graphics program, *DrawPerfect* seems like uncharted territory. For example, rather than moving an object by dragging it, you have to choose a Move command. Then you'll likely have to refresh the screen manually to redisplay objects that lie in the wake of your move. The misery doesn't stop there: You can't resize text blocks, the mouse doesn't function inside the Help screen, and even quitting the program requires a fair amount of concentration.

DrawPerfect's setup is so confusing that our panel failed to stumble on the program's few merits. For one, it's the only DOS program that lets you kern the amount of space between characters. Its macros provide a few surprises; one fixes text to a curve.

In its present condition, though, our panel members wouldn't recommend *DrawPerfect* to their worst enemy. Fortunately, they won't have this version to kick around much longer, because *DrawPerfect* is about to be reborn as *WordPerfect Presentations*—a dramatic facelift that will both overhaul its interface and add a ton of features (see our preview in September and "On the Horizon" in this review). If you'd like to take a look at a demo version of the new program, check out our trial disk offer in this issue.

DrawPerfect 1.1, WordPerfect; 800/451-5151, 801/222-5077 (fax). List price: $495. Reader service no. 731

Freelance Graphics for DOS 4.0

Pros: Provides stand-alone outliner
Cons: Cumbersome installation procedure, difficult to learn, lacks slide sorter, can't generate full speaker notes

It's a good thing we brought in our panel to look at *Freelance Graphics for DOS*. Blinded by its many features, we might have given Lotus's DOS product a decent rating. Our guest reviewers, though, weren't fooled. Sylvie Solard called it "horrific," adding "I never want to touch it again." Tester Rick Talley called the program "sheer torture!" One user complained that slight mouse movements inside all but the central Charts and Drawings window send the cursor flying all over the screen. And *Freelance* wouldn't automatically display a list of files when retrieving documents from disk.

If our panel had managed to scale *Freelance*'s steep learning curve, they might have been less harsh in their criticism. In terms of pure functionality for DOS, *Freelance Graphics* ranks second only to *Harvard Graphics*. It provides the most important organizational features, including a master slide layer and automated templates, both of which allow you to make global changes within a show. *Freelance* is also the only DOS program to provide an outliner.

Freelance for DOS provides a tidy collection of charting capabilities with first-rate linking to *1-2-3* spreadsheets. Its drawing tools also function adequately, though *Freelance* provides a minimal capacity for color and can't produce gradations.

Our panel was unswayed by the extensive feature set, however. And their jeers would probably have been louder had they been forced to install the program. As it was, that frustrating task fell to us. After running the main installer, *Freelance* requires you to copy its fonts, templates, and clip art manually to separate directories on your hard drive. If you want to use the outliner, you have to run a second, separately documented installer. It took us several tries

The unpopular Freelance Graphics for DOS limits the user to 13 screen colors, making for a singularly inflexible working environment.

before we finally got it right. The message? It doesn't matter how many features you offer if no one can figure out how to use them.

Freelance Graphics for DOS 4.0, Lotus Development; 800/343-5414, 617/577-8500. List price: $495. Reader service no. 732

Harvard Graphics 3.01

Pros: Extremely intuitive interface, unrivaled drawing and charting tools, gradient objects and backgrounds, supports builds and interactive buttons
Cons: Lacks outliner and slide sorter, limited to 16 screen colors per slide

If *Windows* isn't part of your PC repertoire, *Harvard Graphics* is the next best thing to being there. Despite the inherent advantages of working in *Windows*—better color control, data linking and object embedding, font sharing—

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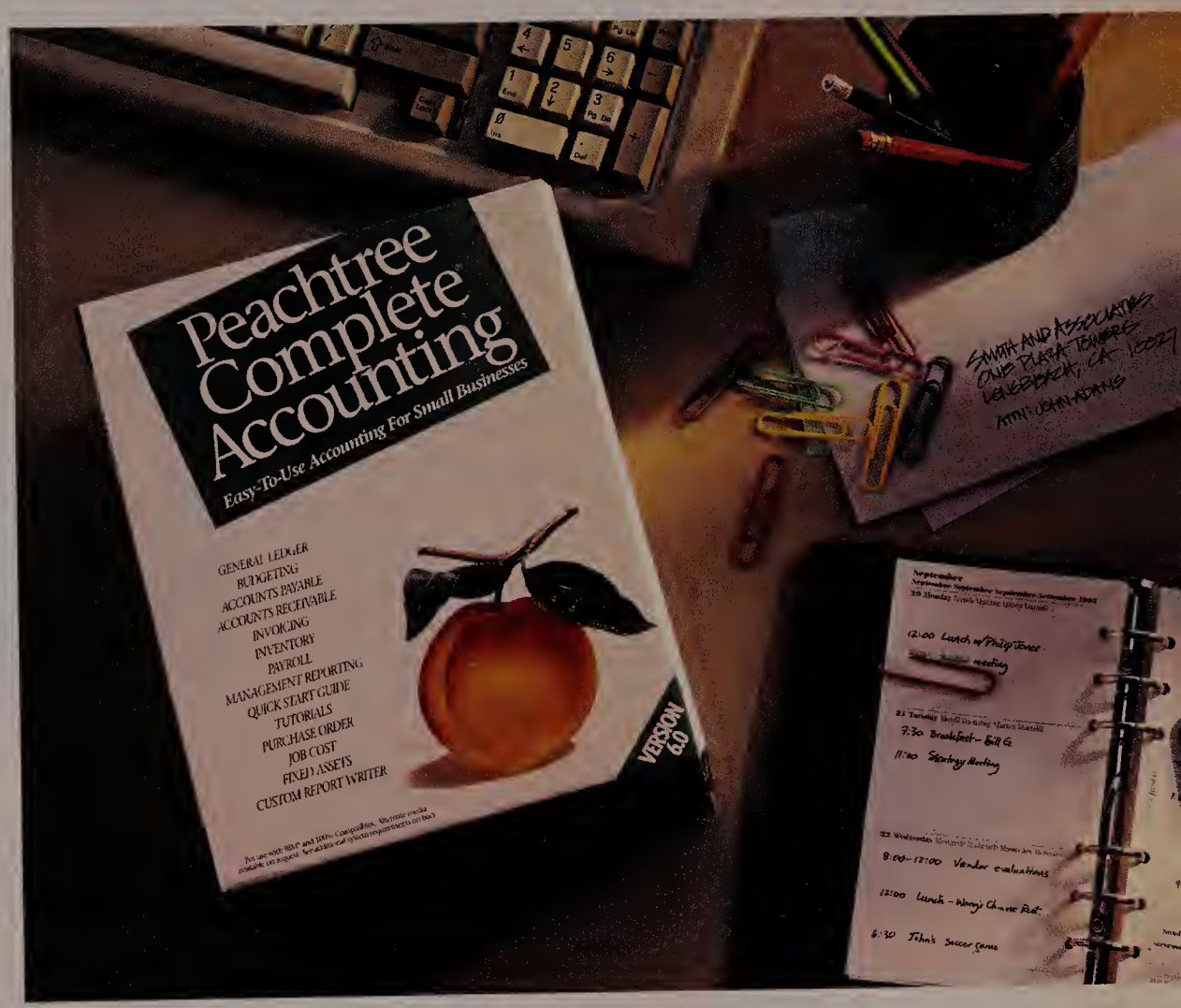

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Harvard Graphics emerged from our testing as one of the best presentation packages on the PC. Because it runs under DOS, *Harvard Graphics* requires considerably less memory, and it opens files and performs other common tasks more quickly than do its *Windows* counterparts.

Where charting and drawing are concerned, *Harvard Graphics* earned top grades. It provides access to every type of chart you'll ever want to create. It even satisfies hard-core business types with a host of arithmetic and geometric calculations, analytical functions, and statistical feedback.

It also satisfied our panel, who found their way through *Harvard*'s elaborate feature set with ease. Tester Jon Jacobi commented that of all the DOS packages, *Harvard* was the "easiest for building a basic slide." And Sylvie Solard noted appreciatively that it was the only package that allowed her to finish the set task in the allotted time. Indeed, all four testers remarked that the program was so straightforward, they almost never touched the manual. Those that did found both the manual and the on-line help to be a real pleasure.

Harvard's drawing window is remarkably intuitive, supplied with a scratch pad just in case you want to experiment with a graphic before adding it to your slide. Also, *Harvard* is the only program other than *Charisma* that converts type to editable graphic outlines, which is extremely helpful for creating logos, filling type with a gradation, and applying special effects. This technique also serves as a useful work-around to offset *Harvard*'s lack of kerning. Finally, *Harvard* is the only program other than *Hollywood* that lets you create text on a curve without resorting to an awkward macro, as *DrawPerfect* requires.

As a slide manager, *Harvard Graphics* ranks only fair. It has no visual slide sorter or outliner, both found in some competing DOS programs, and it's missing a search-and-replace function. We were also disappointed that *Harvard* couldn't display more than 16 screen colors per slide.

But our panel certainly wasn't disappointed. In fact, they waxed ecstatic, awarding top scores to *Harvard* across the board. It's the best presentation program for DOS, plain and simple.

Harvard Graphics 3.01, Software Publishing; 408/986-8000. List price: $595. Reader service no. 733

Harvard Graphics will convert type into editable outlines, letting you manipulate the form of a character and even apply a gradient fill.

Presentation Express II 2.0

Pros: Visual slide sorter, gradient backgrounds, good color control, treats entire presentation as a single unit

Cons: No spreadsheet data link, cannot create run-time screen shows, relatively high memory requirements

It's no *Harvard Graphics*, but *Presentation Express* proved to be a strong performer with our panel. In fact, its ease-of-use ratings were good enough to vault it into second place over both the more powerful *Freelance Graphics for DOS* and *DrawPerfect*.

Express is the only one of our four DOS entries that treats a presentation as a single unit, rather than making you string charts into a show only after each chart has been created and saved to disk. To accomplish this feat, it requires you to store slides into "cabinets," which house templates and other organizational functions. While some of our guest reviewers had trouble getting used to this metaphor, it has its benefits, including the only visual slide sorter available with a DOS program.

Of the four DOS programs reviewed, Presentation Express is the only one that provides a visual slide sorter.

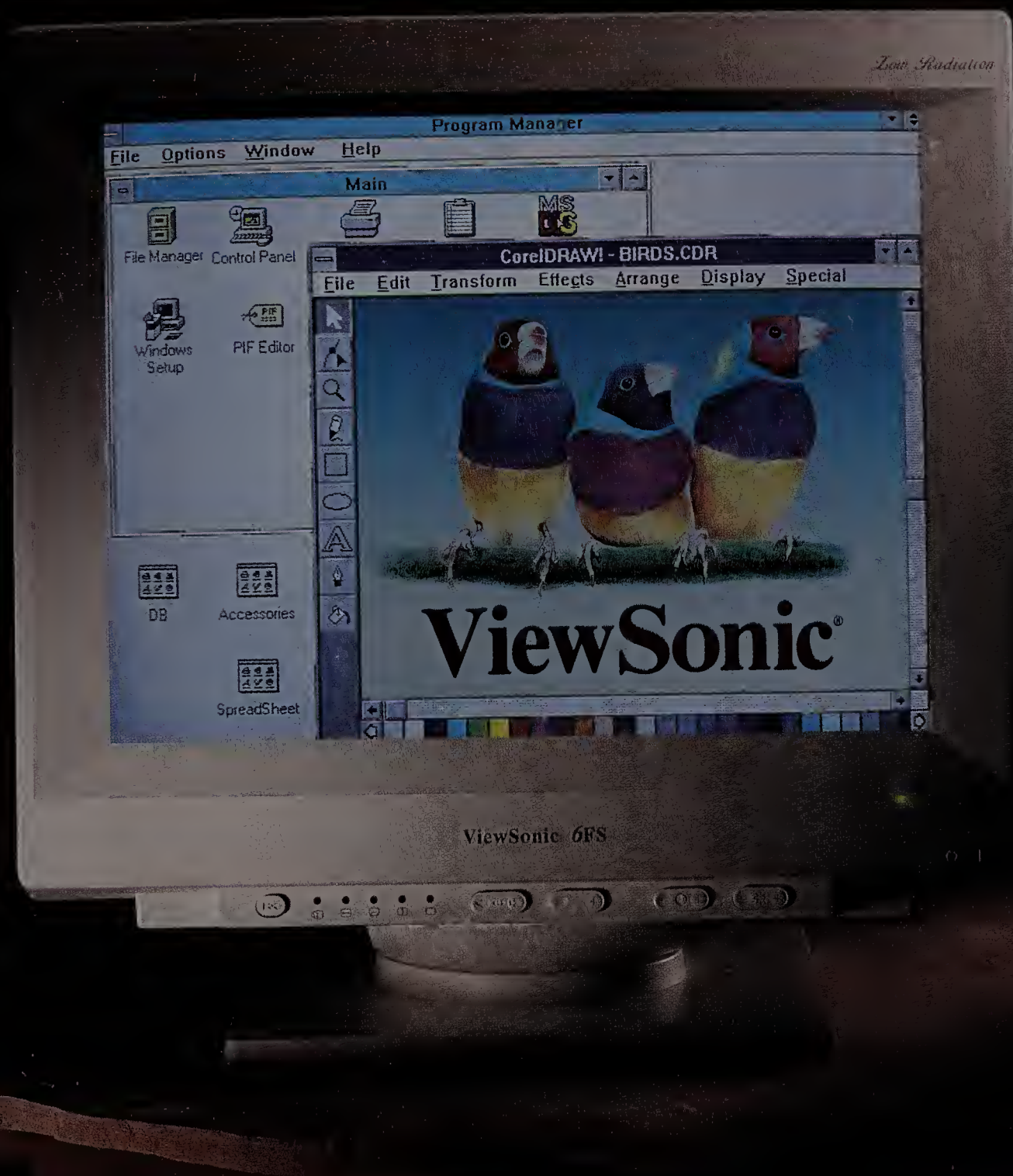
Unfortunately, *Presentation Express* is not without its problems. It's the only presentation program we looked at, for instance, that won't directly import tab-delimited ASCII data; you must convert the tabs to spaces before importing. And other than *Charisma*, *Express* is the only presenter that won't let you save run-time screen shows for distribution to other users, which pretty much limits you to printing slides and overheads.

Fortunately, *Presentation Express* has a revision on the way that promises to address many of its current shortcomings (see "On the Horizon"). For a free look at the new program, check out a demo version in the Software Download library on PC World Online. The program is modular, so you can download parts of it and add additional modules later.

Presentation Express II 2.0, Business & Professional Software; 800/342-5277, 617/494-1155. List price: $495. Reader service no. 734

Deke McClelland is the author of The First Book of PC Paintbrush *(Howard W. Sams, Carmel, Indiana, 1992) and several other books on PC graphics programs.*

Expand Your View



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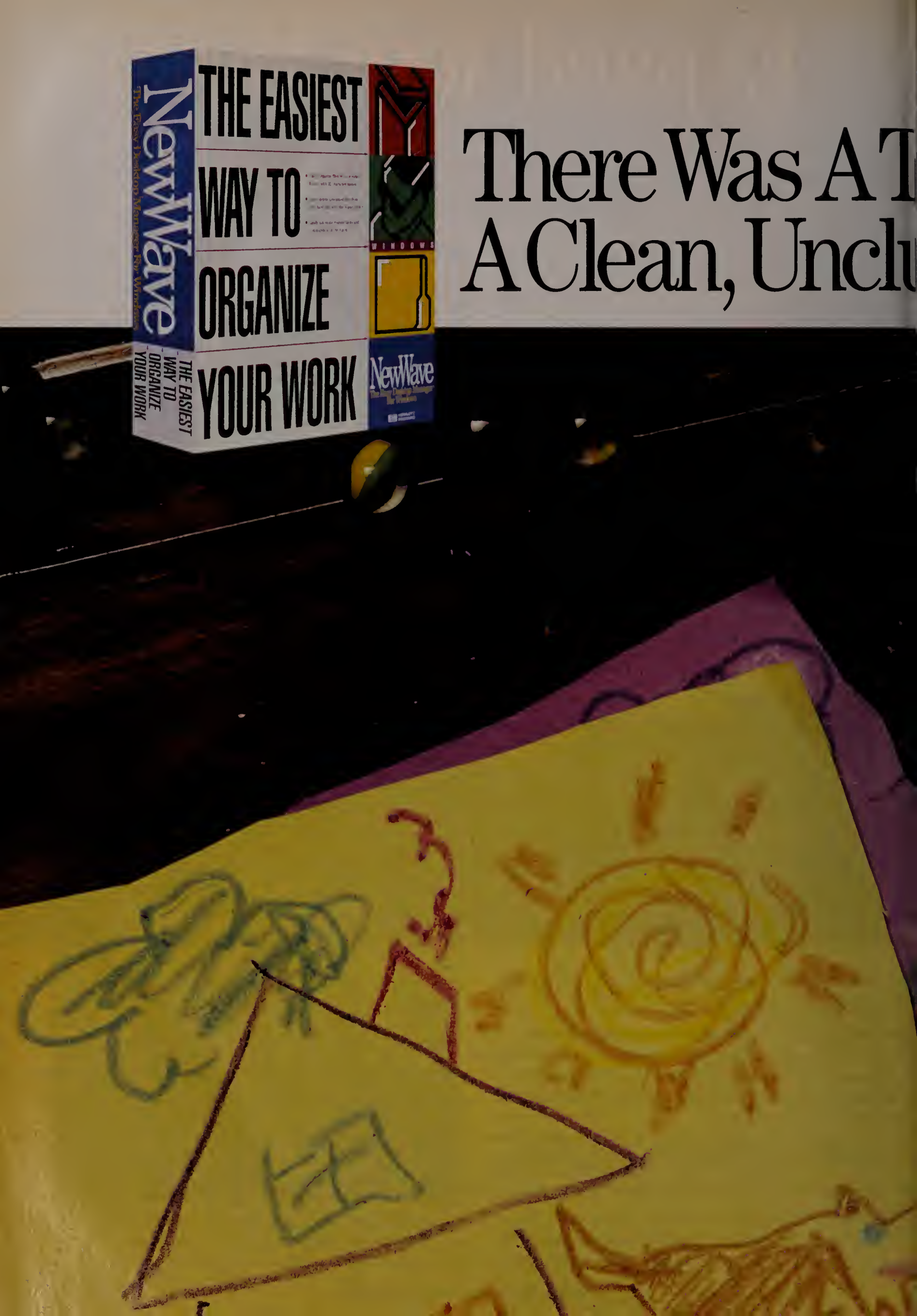
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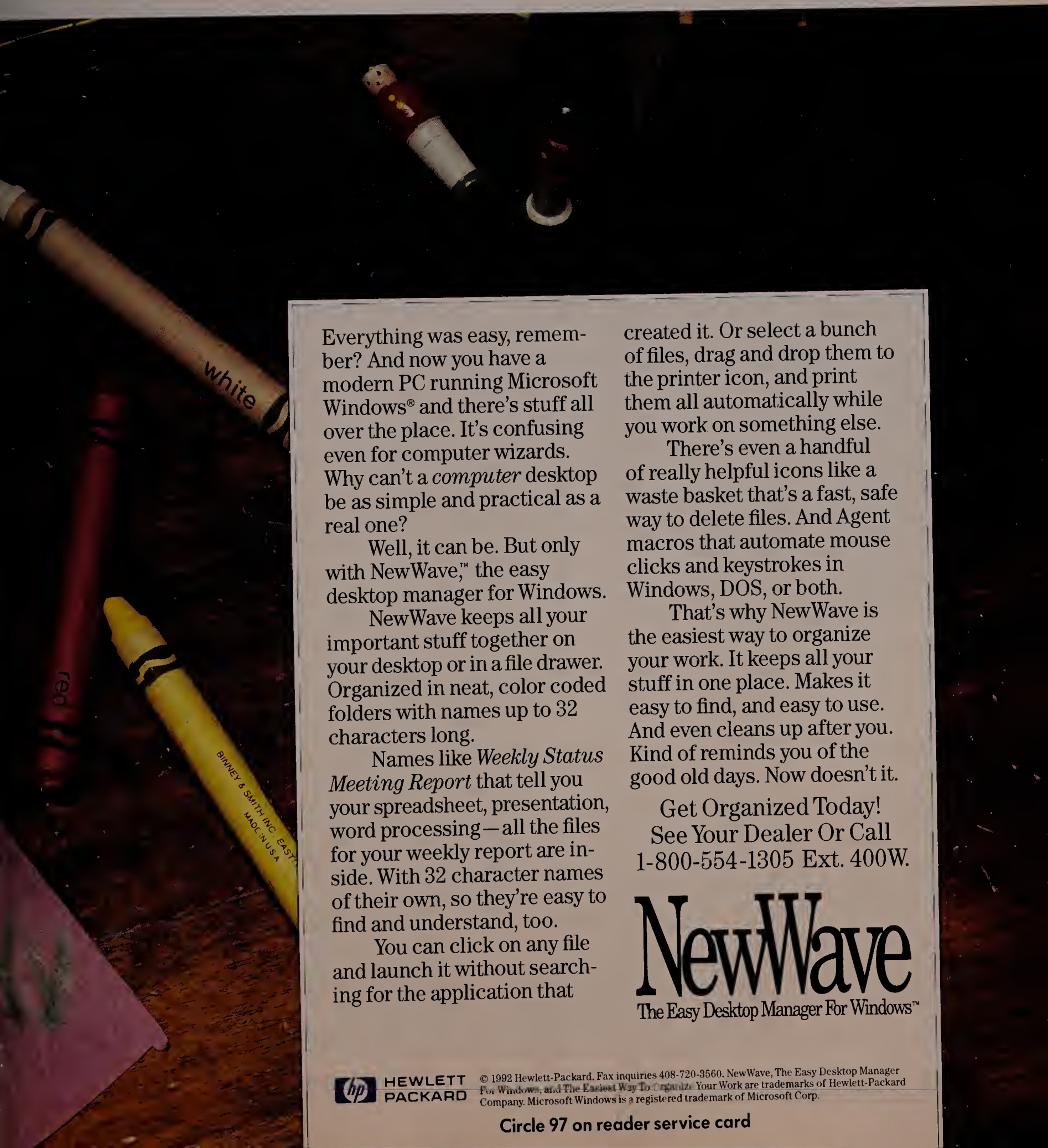

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FEATURES COMPARISON

Freelance and Harvard Share the Spoils

● Yes
○ No
n/a = not applicable

	Windows Programs						DOS Programs			
			BEST BUY					BEST BUY		
	Aldus Persuasion 2.1	Charisma 2.1	Freelance Graphics for Windows 1.0	Harvard Graphics for Windows 1.01	Hollywood 1.0v2	Microsoft PowerPoint 3.0	DrawPerfect 1.1	Freelance Graphics for DOS 4.0	Harvard Graphics 3.01	Presentation Express II 2.0
Standard features										
List price	$495	$495	$495	$595	$499	$495	$495	$495	$595	$495
RAM required	2MB	1MB	2MB	2MB	1.6MB	2MB	384K[1]	455K[1]	438K[1]	512K[1]
Organization										
Master slide	●	○	●	●	●	●	○	●	●	●
Global editing/auto-templates	●	○	●	●	●	●	○	●	●	●
Outliner	●	○	●	●	●	●	○	●	○	○
Visual slide sorter	●	○	●	●	●	●	○	○	○	●
Open/edit multiple presentations	○	○	●	●	●	●	●[2]	○	○	○
Speaker notes/handouts views	●	○	○	●[3]	●	●	○	●[4]	●[4]	●[5]
Spelling checker	●	○	●	●	●	●	○	●[6]	●	●
Search and replace	●	○	○	○	●	●	●	●[6]	○	○
Predefined template formats	259	76	540	648	132	160	24	153	184[7]	247
Charting										
Imports 1-2-3 data	●	●	●	●	●	●	●	●	●	●
Imports Excel data	●	●	●[8]	●	●	●	●	●[8]	●	○
Supports data or Windows DDE links	●	●	●	●	●	○	●	●	●	○
Supports Windows OLE links	●[9]	●[10]	●[9]	○	○	●	n/a	n/a	n/a	n/a
Matches worksheet to chart	○	○	●	●	○	○	○	○	●	○
Bar/column/percentage charts	●	●	●[11]	●	●	●	●[11]	●	●	●[11]
Line/area/scatter charts	●	●	●	●	●	●	●	●	●	●[12]
Exploded pie charts	●	●	●	●	●	●	●	●	●	●
3-D charts	●	●	●	●	●	●	●	●	●	●
Combination charts	●	●	●[13]	●	●[13]	●[13]	●	●[13]	●	●
High-low-close charts	●	●	●	●	●	●	●	●	●	○
Table charts	●	●	●	●	●	○	○	●	●	●
Organizational charts	●	●[14]	●[14]	●	●	○	○	●[14]	●	○
Dual y-axis charts	●	●	●	●	●	○	●	●	●	○
Logarithmic scaling and regression	○	●	●[15]	●	●[15]	●[15]	●[16]	●[15]	●	○
Drawing and text										
Free-form polygon/freehand tools	●	●	●[17]	●	○	●	●	●	●	●
Point-by-point curve tool	○	●	●	●	●	○	●	○	●	○
Line/paragraph spacing	●	●	●[18]	○	●[19]	●	○	●[20]	●[21]	●[20]
Manual kerning	○	○	○	○	●	○	●	○	○	○
Shadowed text	●	○	○	●	●	●	○	●	●	●
Rotated text	○	●	●	●	●	○	●	●	●	○
Text on a curve	○	○	○	○	●	○	●[22]	○	●	○
Shadowed objects	●	●[23]	○	●	●	●	○	○	●	○
Flip/rotate objects	●	●	●	●	●[24]	●	●	●	●	●
Aligns objects to each other	●	●	●	●	●	●	●	●	●	●
Group/ungroup objects	●	●	●	●	●	●	●	●	●	●
Undo/redo functions	●	●	●[25]	●	●	●	●[26]	●[26]	●	●[27]

[1] After DOS loads.
[2] Open and edit two slides.
[3] Handout viewer only.
[4] Character-based notes only.
[5] Speaker note viewer only.
[6] In outliner only.
[7] Charts only.
[8] SYLK files only.
[9] As client only.
[10] As server only.
[11] No percentage charts.
[12] No scatter charts.
[13] Combination bar-line only.
[14] Via template or clip art only.
[15] Logarithmic scaling only.
[16] Regression only.
[17] No freehand drawing tool.
[18] In gross increments only.
[19] Can't reduce line spacing.
[20] Line spacing in tables only.

	Windows Programs						DOS Programs			
	Aldus Persuasion 2.1	Charisma 2.1	BEST BUY Freelance Graphics for Windows 1.0	Harvard Graphics for Windows 1.01	Hollywood 1.0v2	Microsoft PowerPoint 3.0	DrawPerfect 1.1	Freelance Graphics for DOS 4.0	BEST BUY Harvard Graphics 3.01	Presentation Express II 2.0
Graphics and multimedia										
Imports CGM, PCX, TIFF	●	●	●	●	●	●	●	●[28]	●[29]	●
Imports EPS	●	●	○	○	●	●	●	○	○	○
Crops imported images	●	○	○	○	●	●	○	○	○	○
Supports 24-bit color images	●	●	○	○	●	●	○	○	○	●
Preset color schemes	37	34	18	31	24	90	1	6	35	19
Maximum on-screen colors per slide	256	256	256	256	256[30]	256	256	13	16	256
Screen colors available	16.8 million	16.8 million	16.8 million	16.8 million	256	16.8 million	256	110	16.8 million	16.8 million
Gradient objects	○	●	●	●	●	●	○	○	●	○
Gradient backgrounds	●	○	○	●	●	●	○	○	●	●
Extra designer backgrounds	16	3[31]	0	0	0	0	0	0	19	0
Scalable typefaces	13	41	13	5	18	22	0	19	22	8
Supports TrueType font embedding	○	○	○	○	○	●	n/a	n/a	n/a	n/a
Includes Adobe Type Manager	●	○	●	○	○	○	n/a	n/a	n/a	n/a
Clip-art images	100	2200	500	500	130	555	500	1000	500	100
Creates builds within single slide	●	○	○	○	●	●	○	○	●	○
Permits interactive buttons	○	○	○	●	○	○	○	○	●	○
Flying bullets	○	○	○	○	○	●	○	○	○	○
Embedded/imported sounds	○	○	○	●	○	●	○	○	○	○
Supports MCI scripts	○	○	○	●	○	○	n/a	n/a	n/a	n/a
Production										
Communications module	●	●	●[32]	●	●	●	●[32]	●[32]	●	●
Links to Autographix slide service	●	○	●	●	○	○	○	●	●	○
Links to Genigraphics slide service	○	○	○	○	○	●	○	○	○	○
Links to MagiCorp slide service	●	●	●	○	●	○	●	●	○	●
Links to Slidemasters slide service	○	●	○	○	○	○	○	○	○	○
Generates speaker notes	●	○	●	○	●	●	○	○	●	●
Generates handouts	●	●	●	●	●	●	○	●	●	●
Exports CGM	○	●	●	●	●	○	●	●	●	○
Exports PCX	○	●	○	●	●	○	●	○	●	○
Exports TIFF	○	●	○	●	●	○	○	●	○	○
Exports EPS	●	●	●	●	●	●	●	●	●	○
Creates run-time shows	●	○	●	●	●	●	●	●	●	○
Screen show transition options	15	21	13	25	16	46	15	34	40	0
Service and support										
Context-sensitive help	○	●	●	●	●	○	○	●	●	○
Unlimited free support	●[33]	●	●[33]	●	●	●	●	●[33]	●	●
Toll-free support	○	○	●	○	○	○	●	●	○	●
Daily support (hours)	10	24	8.5	9	9[34]	12	11	8.5	9	9
Weekend support	○	●	○	○	○	○	○	○	○	○
BBS support	●	●	●	●	○	●	●	●	●	●
Fax support	●	●	●	●	●	●	●	●	●	●
Other extra-cost training or support	●	●	●	●	○	●	●	●	●	●

[21] No paragraph spacing.
[22] Via macro.
[23] Chart objects only.
[24] Rotate only.
[25] No redo command.
[26] Undelete only.
[27] In draw window only.
[28] Imports CGM and TIFF only.
[29] Gray-scale TIFF only.
[30] Can show only 16 true colors in foreground.
[31] Available only through slide service.
[32] Provided free by slide service.
[33] Free for 90 days.
[34] Six hours on Fridays.

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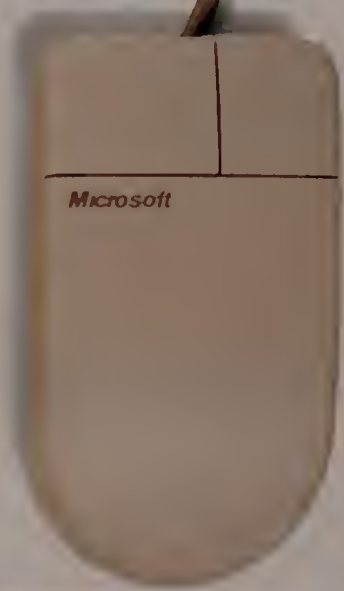

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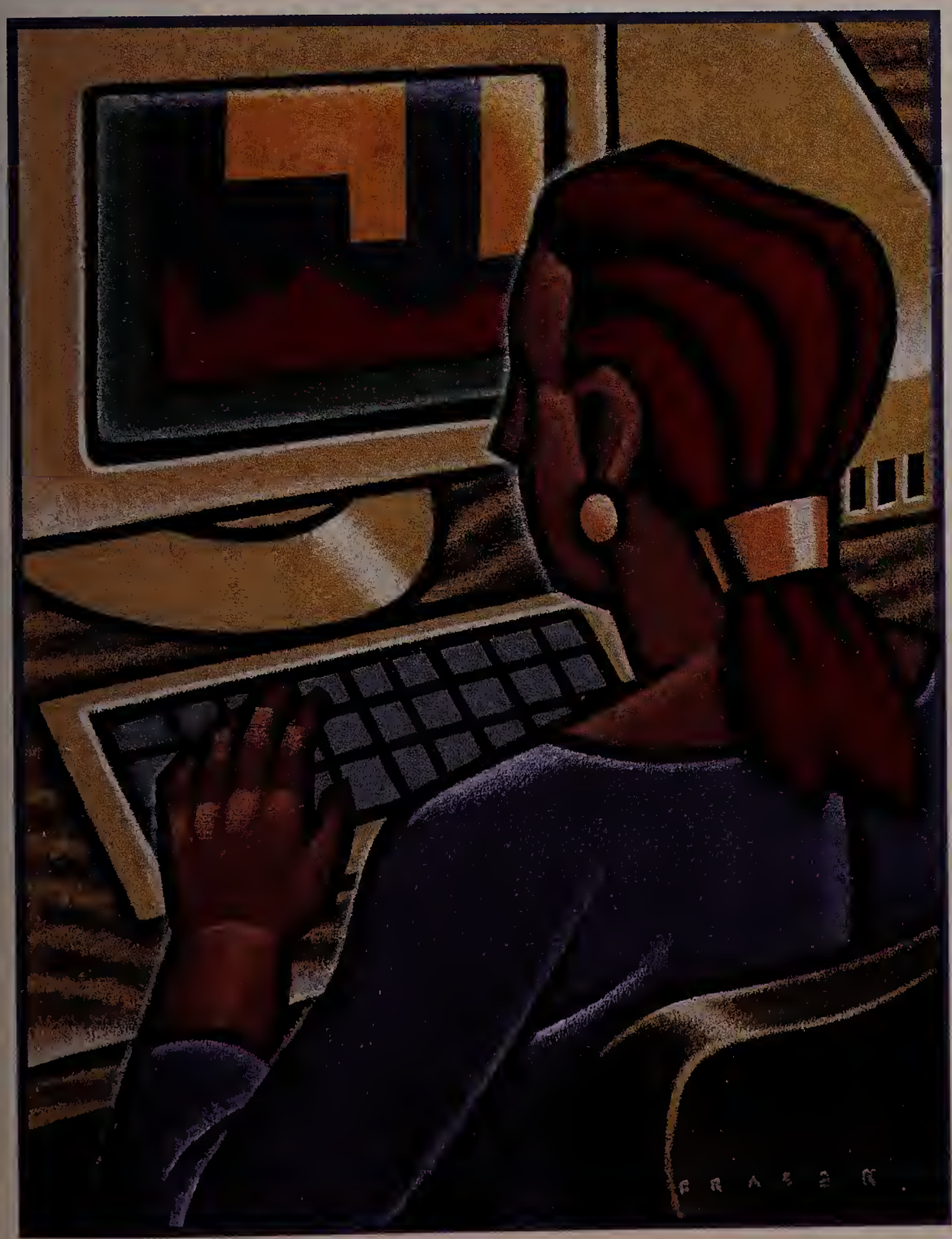
PUT OFF BY BIG-TICKET SOFTWARE? FRUSTRATED BY LIMITED ANALYTICAL CAPABILITIES? THIS GUIDE TO LOW-COST AND TECHNICAL CHARTING PACKAGES COMPLETES THE PICTURE.

BY DEKE MCCLELLAND

The Other Presenters: Budget & Technical Software



DOUGLAS FRASER

Not everyone who makes presentations needs one of the high-octane packages we review elsewhere in this issue (see "Presentation Software Playoffs"). Some people can make do with less—say, a package for a lot less money. Others—financial analysts, scientists, and other professional equation benders—need more, such as a technical presentation graphics program that can handle modeling, trend analysis, and forecasting. Whichever type of program you need, we've got the ticket for you: the ten best-looking presenters for under $300, as well as the four top technical presentation and analysis packages.

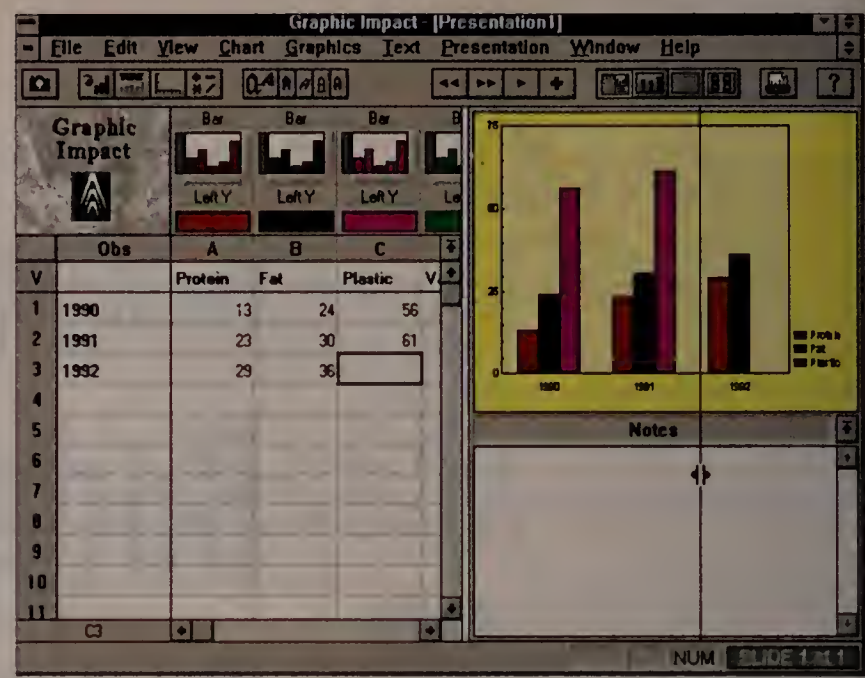
Overcoming Sticker Shock

One of the priciest of the budget lot, Power Up Software's $249.95 *Express Presenter 1.0* rivals heavy-hitting presentation packages in functionality.

This DOS entry provides auto-templates, master slides, and a storyboard view that enables you to input, format, and sort speaker notes. While you must save each chart as a separate file, you can organize multiple charts into a presentation by combining them inside folders, a feature that's analogous to cabinets in *Presentation Express II*, which we looked at in our full review. In fact, at approximately half the price, *Express Presenter* matches *Presentation Express* almost feature for feature.

Next on the slate is a name you may recognize: *CA-Cricket Presents*. In the past, we reviewed this *Windows*-based package alongside the much more expensive likes of *Harvard* and *PowerPoint*. Invariably, it suffered by comparison. In this less-rarefied company, however, Computer Associates' longtime underachiever fares considerably better. As we've noted in years past, *CA-Cricket Presents*, now up to version 1.4, has weak charting tools, lacks a player utility, and doesn't support live links between the slide view and its outliner. The pluses are persuasive, though. Taking a step-by-step approach that novices will appreciate, *Presents* sports some fine organizational tools, including auto-templates. At $199, it may be your best bet if you're more concerned with saving money than having a lot of fancy capabilities.

If your number-one priority is ease of use, $149 will buy you *Pixie 2.31*, Zenographics' cut-rate presenter. It has no organizational tools but provides a singularly intuitive charting environment. Not only can you create the standard array of bar, line, and pie charts, but you also can edit any item in a chart simply by clicking on it and dragging. *Pixie* automatically changes all data, axes, and labels to fit the revised chart. And while most other low-end programs require you to edit the placement and appearance of charts via complex systems of dialog box options, *Pixie* lets you drag titles, labels, and legends to relocate them.



Graphic Impact 2.0, a Windows package from Autodesk Retail Products, lets you split the screen so you can enter data into the worksheet and view its impact on the chart at the same time.

Need something with an analytical mind? For roughly half the price of *Harvard Graphics*, you can pick out a copy of DOS-based *Graph-in-the-Box Executive 1.14* from New England Software. Its $299.95 price tag makes it the most expensive of the budget solutions, but it's still a relatively cheap way to calculate standard deviations, logarithmic and exponential trends, and residual variances. An even cheaper solution is Autodesk's $149 *Graphic Impact 2.0*, the *Windows* version of *Graph-in-the-Box*, licensed from New England Software. In addition to analytical and statistical functions, *Graphic Impact* throws in a few conveniences including a slide sorter, a spelling checker, and a split screen so that you can enter data and see how it affects your chart immediately.

For those times when you want to impress, QuickGraph Plus 1.1 tiles banner-style charts across multiple pages and even lets you create run-time screen shows—a first for a dedicated charting utility.

Chart specialist *QuickGraph Plus 1.1*, another program that's available for both the DOS and *Windows* environments, provides some unique extras. To accommodate similar series, the $149.95 program automatically breaks up data into separate side-by-side graphs rather than requiring you to separate the data by hand. For those times when you want to impress, *QuickGraph* tiles banner-style charts across multiple pages. It even creates run-time screen shows—a first for a dedicated charting utility. If that's not enough, the upcoming version 2.0 for *Windows* promises a built-in outliner, a revised interface, and support for OLE as both server and client.

3-D Charts II 2.0 is a *Windows* product that excels at the creation of, you guessed it, 3-D charts. Lacking basic slide-management capabilities, *3-D Charts II* specializes in spectacular graphics. After generating a 3-D chart, the program lets you manipulate it by rotating it and moving it toward or away from the viewer. *3-D Charts II* also offers detailed control over objects and gradations. You can convert a rectangle to an isometric cube and subject each face to slightly different lighting. When shading an object or background, you can select from a linear or circular gradation and set the exact position of the first color in the blend, a necessary function when you're highlighting a circle to make it look like a 3-D sphere. At $99.95, *3-D Charts II* is a bargain-basement carnival of special effects.

In Pixie you can resize a column in a chart by simply dragging at it. The program automatically updates the worksheet accordingly, as witnessed by the Value window in the lower-right corner.

Eastman Kodak Company, 1992

If your presentations are primarily org charts, flow charts, and other diagrams employing symbols, text, and connected lines, Novagraph's *Chartist* should pique your interest. A *Windows* application, it includes a library of standard shapes and offers multiple style properties for borders, lines, and arrowheads. Line styles include routing instructions: Drag a symbol across the screen, and any connecting lines redraw automatically. You can import scanned photos, bit maps, and other graphics into your charts, and a hypertext feature brings up any referenced *Windows* document in its native application when you press <Ctrl> and double-click on a symbol. *Chartist* lacks screen-show and presentation skills, but at $109, these are limitations you can probably live with.

Presentation packages are great tools for general business use: sales, proposals, and the like. But heavy-duty number crunchers need tools that provide analysis as well as presentation talents.

When it comes to spectacular text charts, the $95 *GraphicWay 1.0a* is the welterweight winner. Available for both DOS and *Windows*, *GraphicWay* combines the standard collection of charting tools with some nice drawing tools. But its text tools lift it above the pack. *GraphicWay* matches *Harvard Graphics* by allowing you to convert letters to editable outlines, fill letters with gradations, and wrap text around a circle or other curve. But that's just the beginning. You can also extrude text to create a 3-D effect, making your words appear to jump off the screen, or apply an envelope effect to bow a word outward, like letters applied to a cylinder. Finally, you can add visual perspective to your text so that, for example, it looks as if it rests on a billboard. With such a variety of special effects at your disposal, you'll probably be tempted to overdo it.

If even *GraphicWay*'s price doesn't make you reach for your wallet, *Easy Working Presentation Maker 1.0* might. At $49.95, this program takes the bare-bones approach. Adequate for little more than printing basic charts and graphs using a seven-color palette, this program consumes only 530K, making it the smallest of the budget presentation programs and the only one that ships ready to launch from a double-sided floppy. But if you're short on disk space and cash, *Presentation Maker* makes the fundamentals look appealing.

The Techno-Wizards

Presentation graphics packages are great tools for general business use: sales, proposals, and the like. But while they provide a sufficient variety of colorful charts to convey the information and impress your audience, they don't offer enough muscle power for heavy-duty number crunchers. These technical users need a tool that provides analysis as well as presentation talent. That's where the techno-wizards come in.

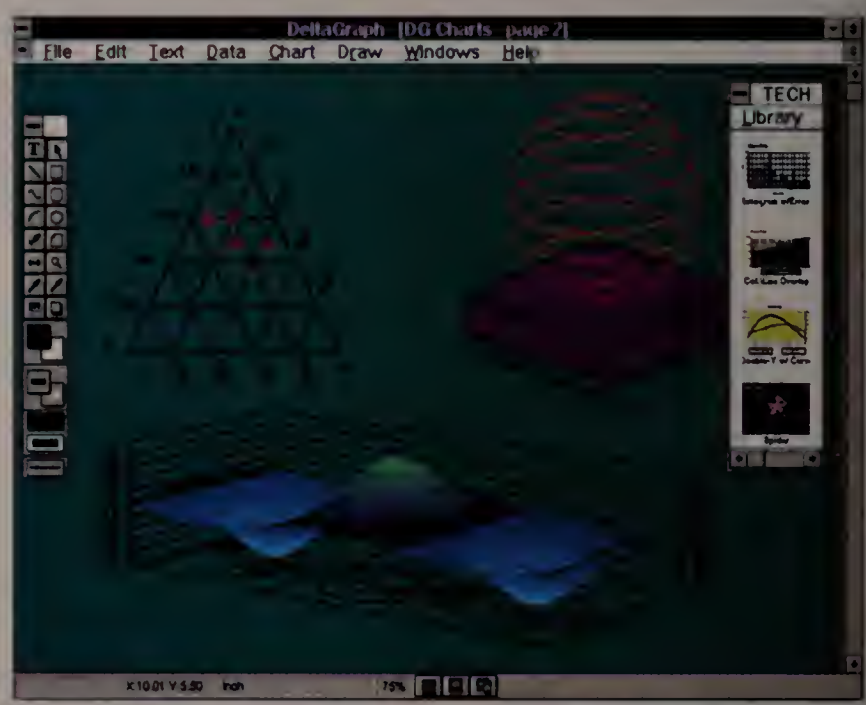
These four packages—DeltaPoint's *DeltaGraph Professional for Windows*, Advanced Graphics Software's *SlideWrite Plus for Windows*, MicroCal's *Origin*, and 3-D Visions' *Stanford Graphics*—price out in the same $500 ballpark as the presentation programs that are featured in "Presentation Software Playoffs." But rather than emphasizing slide management and drawing tools, these packages aim their sights beyond the range of casual users and move into the realm of the charting pros.

Well known on the Macintosh platform, *DeltaGraph Professional for Windows 1.0* is a new and immensely powerful player on the PC. You're unlikely to find a chart that *DeltaGraph* doesn't support. It offers all kinds of 2-D charts, including such analytical types as step, stacked pie, and bubble charts. If you need a fresh perspective, *DeltaGraph* can map polar, ternary (three-variable), and spider coordinates. It builds on the popular 3-D chart metaphor by allowing you to rotate charts and substitute rectangular columns with more ornamental pyramids, obelisks, or cylinders.

If science is your game, *DeltaGraph* provides 3-D surface charts that permit both incremental and true *z*-axis values. The program also incorporates free-form *x-y-z* scatter and topographical charts, essential when you need to map longitude and latitude with respect to elevation. Add its 50 mathematical, statistical, and data analysis functions to its OLE client and server support, its visual slide sorter, and its capability to create run-time screen shows, and you have a program that's as far beyond the capabilities of a traditional presentation package as an oil rig exceeds the capabilities of a soda straw.

Compared with *DeltaGraph*, *SlideWrite Plus for Windows 1.10* is a little package with a bare framework of capabilities. Although available for both DOS and *Windows* platforms (the other three competitors are *Windows*-only products), *SlideWrite* provides only the most standard collection of chart types, comparable to those found in *Harvard Graphics*. Furthermore, its display capabilities are limited to 16 colors, and it fails to provide true 3-D charts.

While the program offers enough analytical functions to qualify it as a technical graphics package, including histograms, mathematical curve fitting, equation plotting, and statistical reports, *SlideWrite*'s primary emphasis seems to be scientific drawing. In fact, its greatest strength is its figure packs, which include specialized symbols geared toward electronics, medicine, chemistry, and bioengineering. But at $99 a pop, these optional packages can add up.



DeltaGraph Professional is a dynamo. Here we feature a ternary graph, a spheral x-y-z scatter line chart, and a 3-D surface map.

Origin 2.0 is a step up from *SlideWrite*. It provides sophisticated mathematical and statistical operations; charts polar and ternary val-

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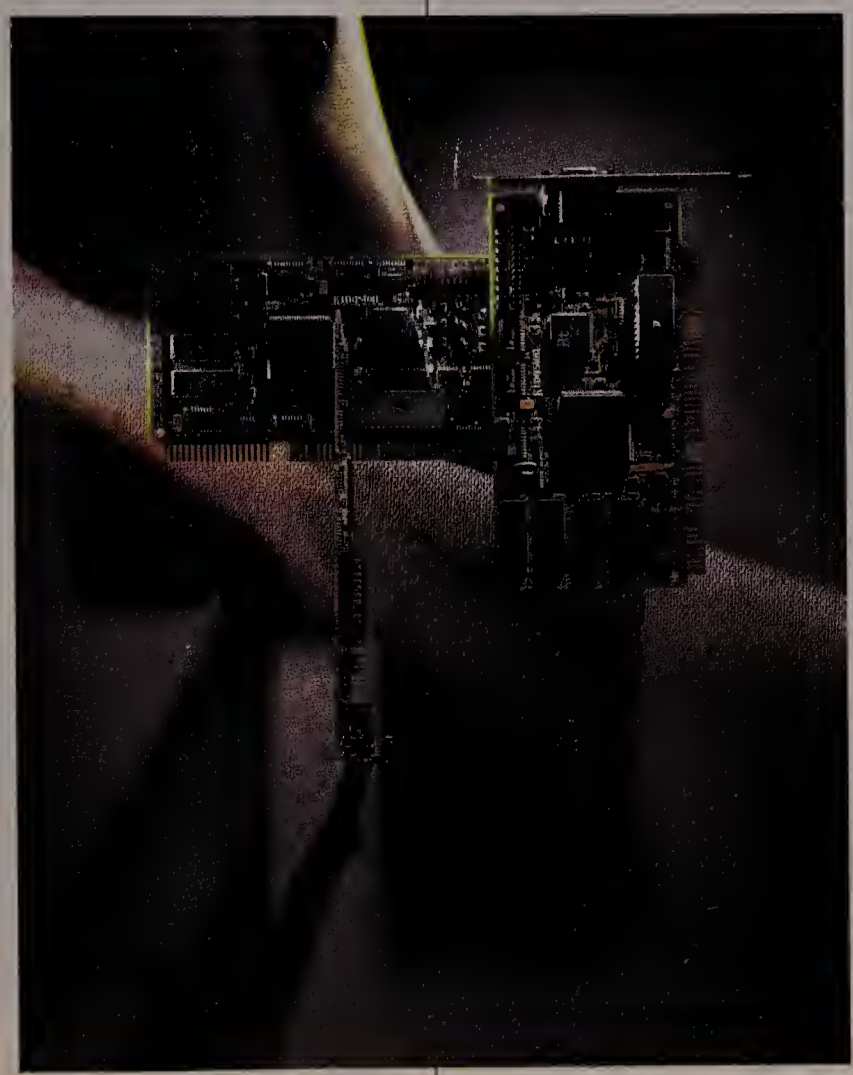

But we also know that budgets are tight; and when faced with the choice of just muddling along with slow business applications or spending hundreds of dollars on a Windows accelerator, you may reluctantly choose to just muddle along.

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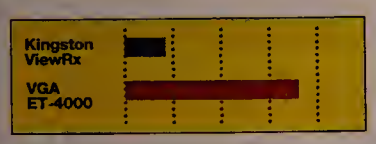

ViewRx is based on the Weitek 5186 chip that has Windows BitBLT and line draw functions built in. That means that these often used Windows functions are handled by ViewRx, not by the CPU. And that means better performance for you. ViewRx supports up to 1024 x 768 screen resolution to fit even the largest spreadsheets on the screen. For the least possible screen flicker, ViewRx offers a 72Hz refresh rate and supports non-interlaced mode. ViewRx comes complete with trouble free drivers for Windows 3.1 and popular CAD packages.

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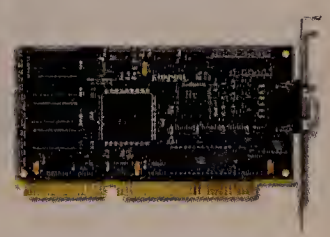

Microsoft Excel spreadsheet tested on 386SX-20 PC. All Trademarks and Registered Trademarks are of their respective holders. Kingston and Kingston Technology are Registered Trademarks of Kingston Technology Corporation.

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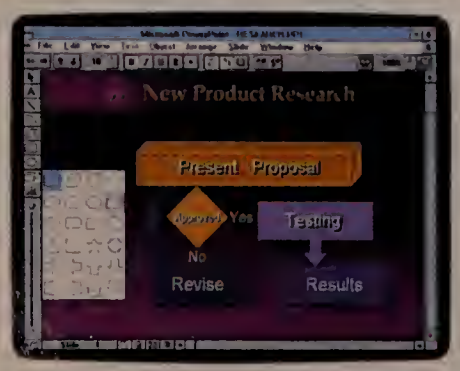

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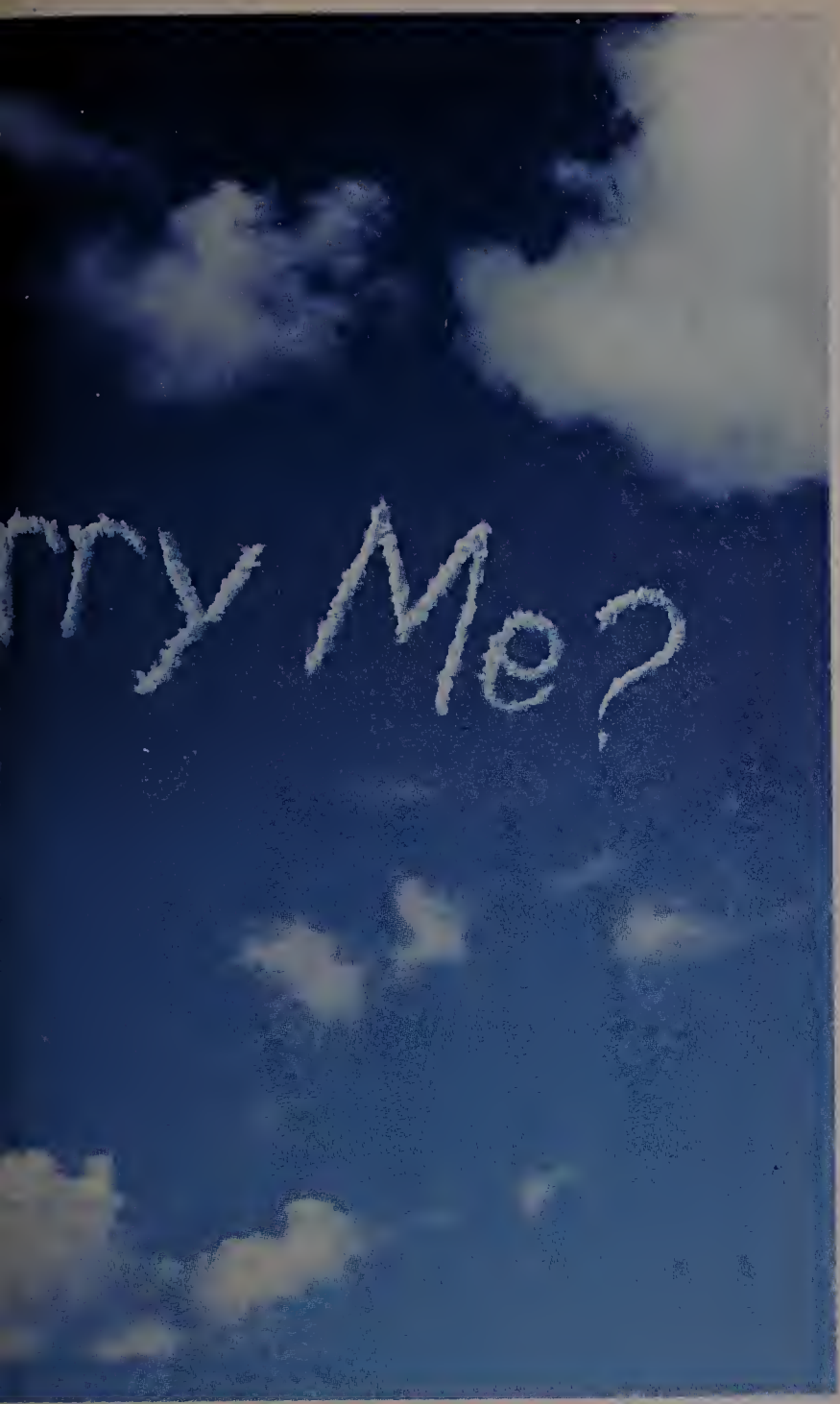

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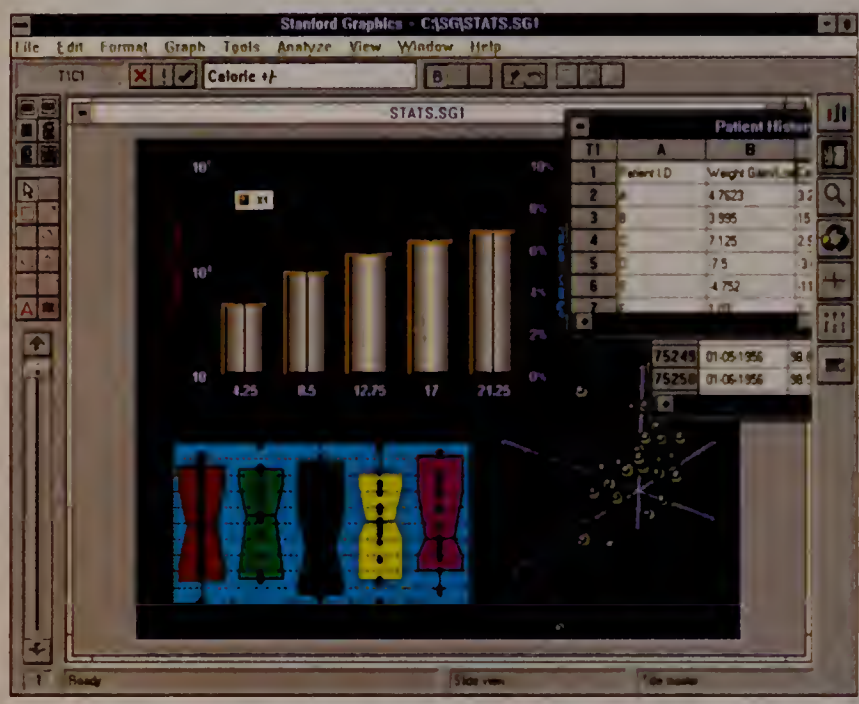
ues; offers Gaussian, Lorentz, and Boltzman curve fitting; and supports Bessel functions. You can automate the creation and manipulation of charts by linking buttons to custom operations created using *Origin*'s built-in LabTalk scripting language.

However, while indisputably powerful, *Origin* lacks *DeltaGraph*'s wide range of slide-management features, and it can't yet accommodate true *x-y-z* charts. (MicroCal plans to release a 3-D module by the time you read this; it should cost over $100.) You can check out the program for yourself by ordering a free working model of *Origin* direct from MicroCal. The only differences between it and the real thing are that the model prints a promotional message and does not allow you to save your documents to disk.

With its auto-templates, built-in outliner, and 48 custom TrueType fonts, Stanford Graphics appears positioned to merge the worlds of scientific functionality and mainstream presentation.

To our mind, the only product that approaches *DeltaGraph*'s functionality and versatility is *Stanford Graphics*. If your data knows no limits, you'll appreciate *Stanford*'s 4-D, trillion-cell worksheet equipped with a healthy supply of mathematical, analytical, and scientific functions. As with *Origin*, Bessel, Gauss, Kronecker, and the other legendary thinkers are well represented. *Stanford* can plot polar, Cartesian, or cylindrical coordinates. Its statistical graphs include linked scatter plots, Box-Whisker charts, error-bar plots, and Pareto charts. You can even combine charts to create such freaks of graphing as 3-D histograms and pie-bubble charts, in which you carve each bubble into fractional slices. By the time you read this, version 2.0 should be shipping, featuring a generous supply of sexy presentation options. In addition to gaining new chart types and 29 more statistical functions, you'll be able to create run-time screen shows to display on other machines. *Stanford Graphics 2.0* also intends to go after the likes of *Freelance Graphics* and *Harvard Graphics* by adding auto-templates, a built-in outliner, and 48 custom TrueType fonts. If any package appears positioned to merge the worlds of scientific functionality and mainstream presentation, it's *Stanford Graphics*.

Deke McClelland is the author of The First Book of PC Paintbrush *(Howard W. Sams, Carmel, Indiana, 1992) and several other books on PC graphics programs.*



Stanford Graphics' statistical graphs include (clockwise from top left) an error-bar column chart, a 3-D scatter plot, and a Box-Whisker plot.

For more information about all products in this article, circle reader service no. 902.

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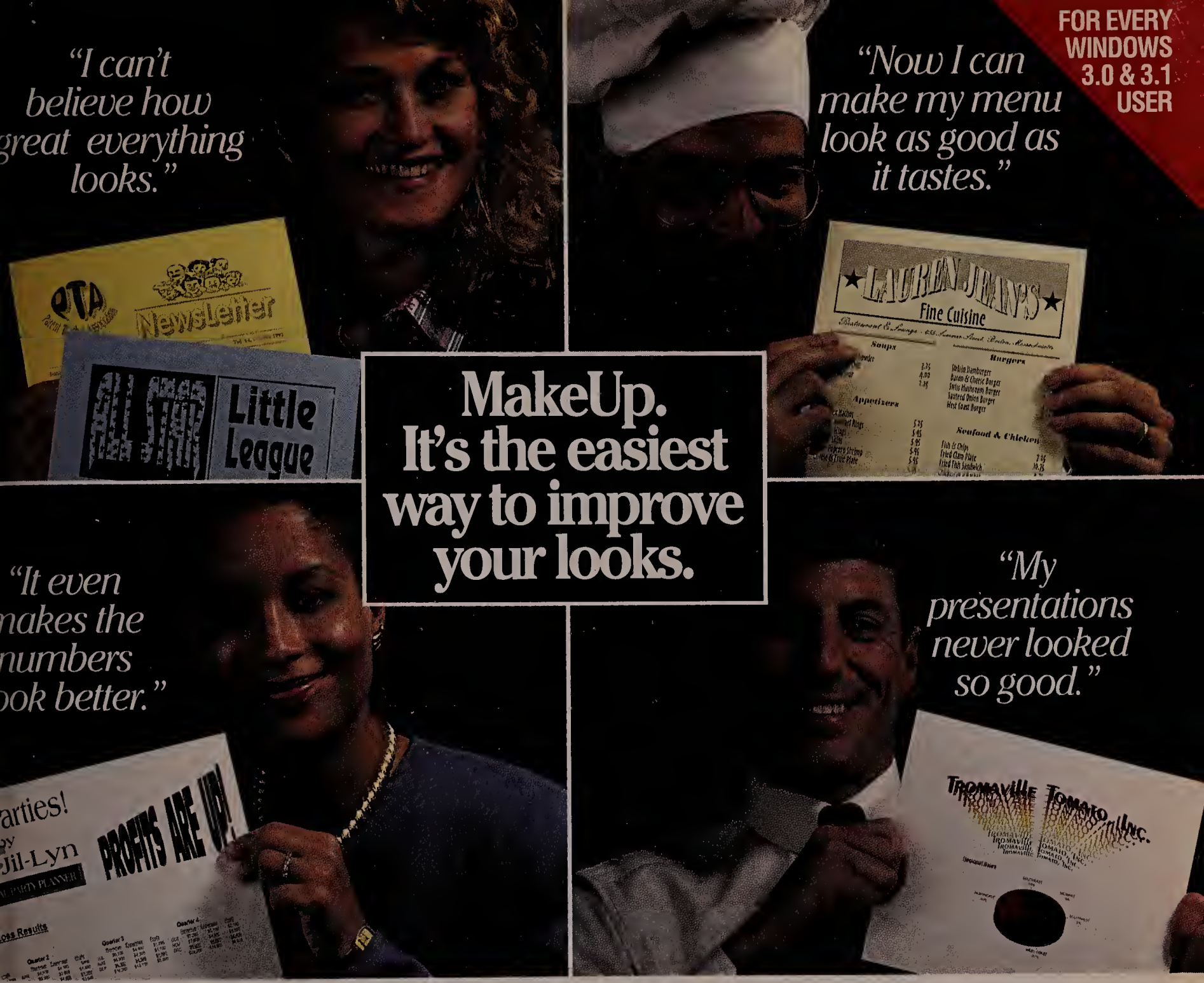

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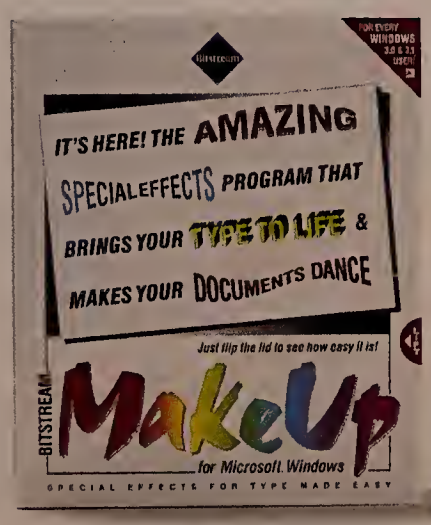

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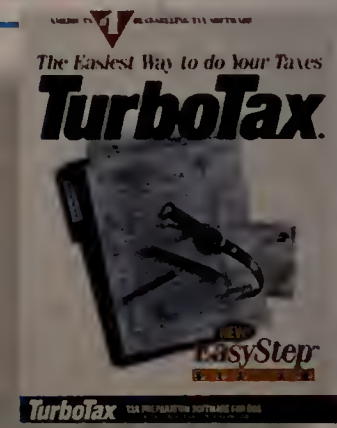

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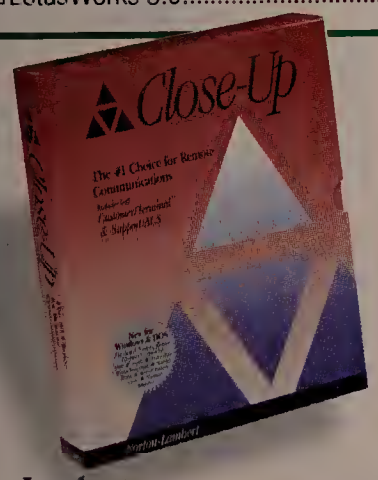

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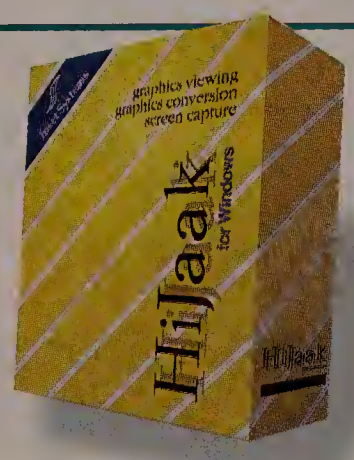

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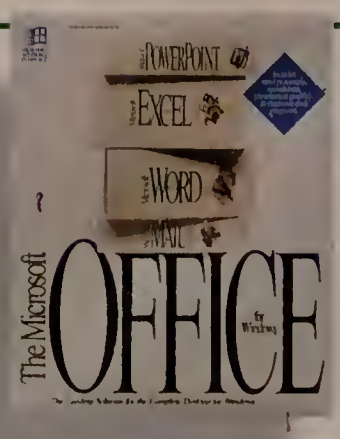

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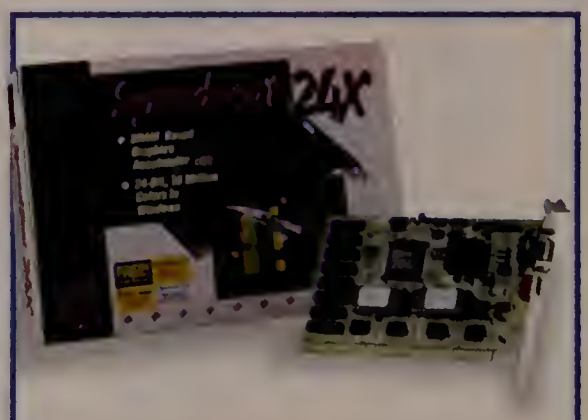

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8531 ⊡*Autoworks*—Get to know your car bumper to bumper. Provides overview of systems, in-depth graphics, & animation **$49.**
5145 ⊡*Bodyworks 1.0*— Explore the major systems of the human body ..... **49.**

Appoint ... limited lifetime
2469 Thumbelina PC or 2480 MousePen Pro PC 62.
ATI Technologies ... 2 years
9985 VGA Integra *(1024 x 768, 16 colors)*..... 84.
8463 VGA Wonder XL24 *(with 1 MB)*..... 149.
2382 Graphics Vantage VGA *(with 1 MB)*..... 225.
9822 8514/Ultra *(with 1 MB) (requires VGA)*. 269.
2012 Graphics Ultra with VGA *(with 1 MB)*... 299.
3902 Stereo•F/X *(sound board)*..... 109.
3900 VGA Stereo •F/X *(w/512K, upgrd. to 1 MB)*215.
Boca Research ... 5 years
7150 BOCARAM/AT PLUS *(2 MB)* ..... 175.
7139 *(4 MB)* ..... 259. 7138 *(8 MB)*..... 459.
8398 External 14,400 Baud V.32 FaxModem 275.
8397 Internal 14,400 Baud V.32 FaxModem 219.
6998 I/O Board for AT.. 49. 6999 for PS/2 .. 89.
8380 BasicVGA.... 49. 8381 SuperVGA... 115.
Bravo Communications ... 2 years
7400 2 Position Laser Compatible Switch Box 109.
7501 CPS1021 *(electronic switch box)*..... 135.
Brown-Wagh ... 1 year
8578 Creative Labs Sound Blaster..... 109.
2336 Creative Labs Sound Blaster Pro ..... 189.
Caere ... 1 year
8158 Typist Plus Graphics ..... 375.
Canon ... 1 year
We are an authorized Canon Service Center.
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8940 BJ-C800 Color BubbleJet Printer ..... 1899.
7897 BubbleJet Ink Cartridge *(BJ-10ex)* ..... 23.
7896 BJ-10ex Sheet Feeder ..... 75.
Cardinal ... 1 year
8689 386SX-33 MHz Motherboard ØK ..... 275.
8690 MVP24I Modem Value Pack ..... 39.
8691 MVPI24IF FaxModem Value Pack ..... 64.
8633 VideoColor 24 VGA7000 ..... 179.
Chips & Technologies ... lifetime
6137 SuperMath 387DX-25..... 81.
6138 387DX-33.... 85. 6126 387SX-25 .... 69.
CoStar ... 1 year
1947 LabelWriter II ..... 185.
COVOX ... 1 year
5543 Sound Master II ..... 145.
Curtis ... lifetime
1708 Ruby-Plus SPF-2+..... 59.
7358 Command Center SPF-4 ..... 79.
Cyrix Corporation ... 5 years
MATH COPROCESSORS
9877 FasMath 83S87-16 *(SX compatible)* ..... 69.
9875 FasMath 83D87-25 or 9876 83D87-33 *ea.* 89.
Diamond Computer ... 5 years
8333 SpeedStar 24X Graphics Accelerator .. 179.
6945 Stealth Hi-Color ..... 239.
Epson ... 2 years
We are an authorized Epson Serivce Center
5555 AP-3250 *(80 col., 200 cps, 24 pin)*..... 229.
1906 FX-850 *(80 col., 264 cps, 9 pin)*..... 319.
1904 FX-1050 *(136 col., 264 cps, 9 pin)*..... 449.

The frost is all over the proverbial pumpkin up here in Marlow, NH (pop. 601), and we're ready to hunker down for some serious snowfalls and toe-tingling temperatures. Meanwhile, our mascots have paused to give thanks for another year of successful nocturnal visits to our vegetable garden! Well, why not share the bounty? That's what we're doing with this smorgasbord of specials good through 11/30/92. No turkeys here!

Asymetrix
5766 ▣ *MediaBlitz! 1.0*—Windows 3.1 multimedia utility for editing and synchronizing clips. Create shows in minutes and integrate them into other Windows applications with DDE. Over 70 clips free upon registration.

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5988 ☐ *Adobe Illustrator 4.0 Competitive Upgrade*—Owners of draw and design programs can trade up to Illustrator 4.0. Includes *TypeAlign, ATM, Separator,* 40 fonts, pre-drawn artwork, and more.

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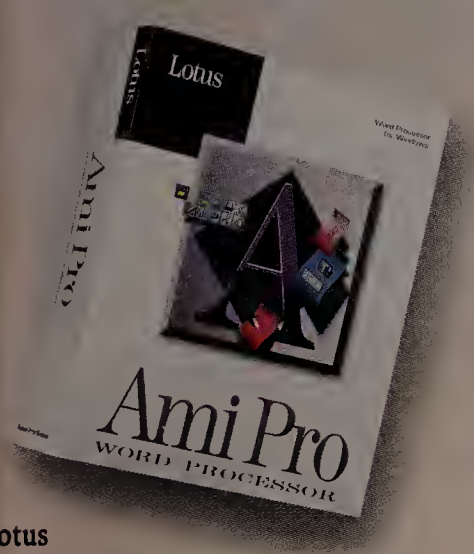

Lotus
5799 ▣ *Ami Pro 3.0*—Includes new direct access features, including Fast Format, SmartIcon sets, Drag & Drop, and SmartClick. Get a free copy of *Intermission Screen Saver* (ends 11/30/92).

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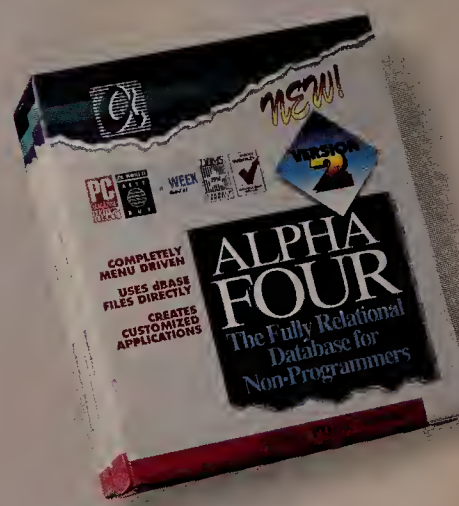
Intel ... 3 years
5990 *SatisFAXtion Modem 100*—Intel SatisFAXtion interface and compatibility at an unbeatable price. Internal 2400 bps data modem, 9600/4800 bps fax, bundled with a free copy of *Faxability Plus* (ends 11/30/92).

$99



Alpha Software
5104 ▣ *Alpha Four 2.0 Server w/2 Free LAN Packs*—Fully relational database-management system for non-programmers. Create complex applications through menus. Uses dBase file format. Incl. *Presentation Express* and a *Zip Code Database* free (ends 11/30/92).

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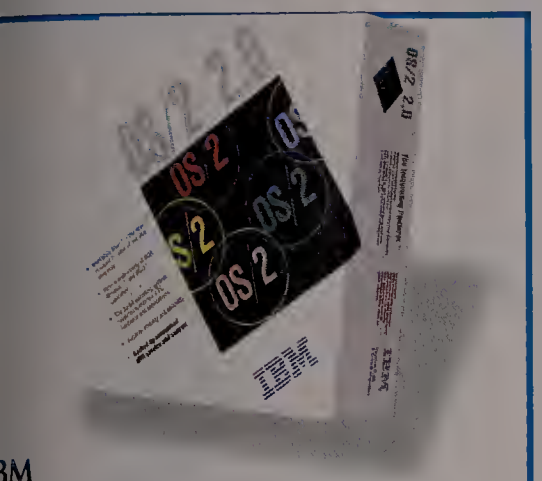

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303 □ *OS/2 2.0 Upgrade from DOS*—
'pgrade to OS/2 2.0 from DOS (any
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uns DOS, Windows, and OS/2 applica-
ons. 386SX PC's and above..... **$99.**

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95 OPTIMA 144+ FAX 144..... 479.
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MATH COPROCESSORS
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Keytronic ... 3 years
18 101 Plus Keyboard..... 99.

Logitech ... limited lifetime
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43 Trackman Portable ..... 99.
75 ScanMan 256 ..... 269.
95 MouseMan *(combo)* 69. 9766 *(cordless)* 89.

MediaVision ... 3 years
37 ProAudio Spectrum 16 ..... 199.
04 Thunder & Lightning ..... 219.
38 MultiMedia PC Upgrade Kit 16 ..... 969.

Megahertz ... 5 years
6576 P296FMV Fax Modem *(9600 baud V.42)* $479.
6574 T396FM Fax Modem *(9600 baud)*..... 499.

Microsoft ... lifetime
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2898 Mouse with Windows 3.0 *(bus or serial)* 149.
1896 Ballpoint Mouse *(serial only)* ..... 119.

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6007 PC-TRAC Trackball *serial* .... 75.

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2736 ScanMaker 600G *(gray-scale scanner)* 759.
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5979 NewPoint..... 79.

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8450 Color Artist for Windows..... 319.

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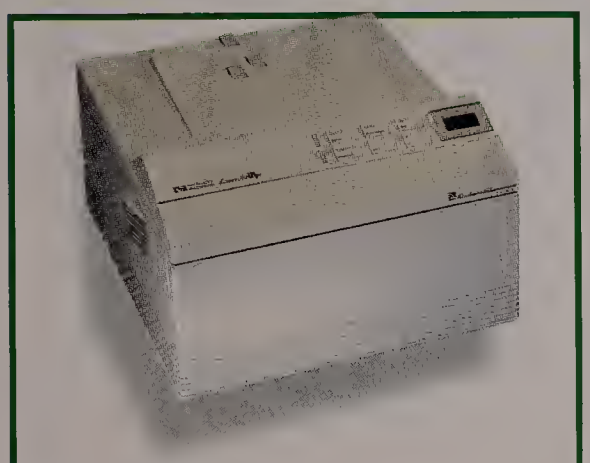
4252 MultiSync 3FGX Monitor *(14")*..... 689.
4249 4FG Monitor *(15")* 799. 3151 5FG *(17")* 1449.
5377 SilentWriter Model 95 PostScript Laser 1439.



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9833 Pacific Page XL *(w/accelerator board)*. 699.
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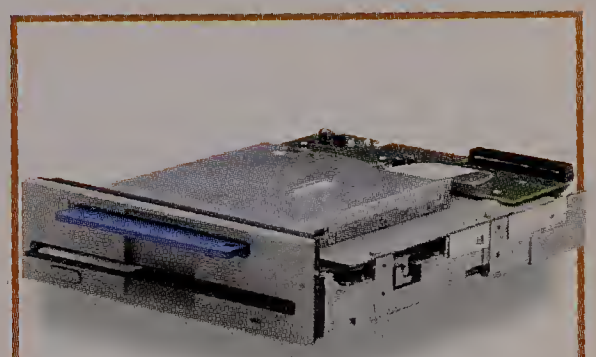

TEAC ... 1 year
4414 *3½"/5¼" Dual Floppy Drive*—Get two drives in one. TEAC's new Dual Floppy Disk Drive gives you both 3½" and 5¼" in one, saving you space and money ... **$145.**

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8993 PM2400 Modem *(internal, V.42bis)*..... 115.
8994 PM2400 Modem *(external, V.42bis)*..... 125.
8132 PM2400 Pocket Modem..... 109.
2266 PM9600 Internal Modem ..... 275.
7934 PM9600SA Modem ..... 289.
2264 PM2400FX96 *(internal modem/fax)* ..... 95.
1344 PM2400FX96SA *(external modem/fax)*.. 99.
3803 PM14400FX96 *(internal modem/fax)* ... 359.
2425 PM14400FXSA *(external modem/fax)*.. 399.

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6444 ProModem Ultima Home Office *(int.)* ... 389.

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6449 Series 3 Palmtop *(256K)* ..... 379.

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4804 Pocket Fax Windows..... 189.
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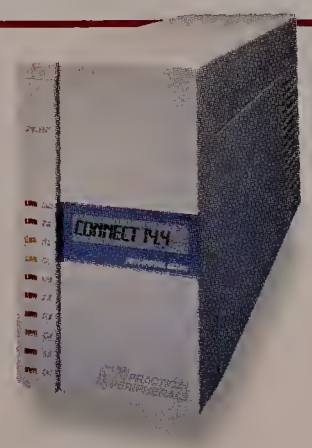

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8593 TheComplete Communicator Gold..... 479.
5140 TheComplete Page Scanner w/OCR ... 579.
Tripp Lite ... 2 years
6199 Isobar 4-6 *(4 outlets, Gold Seal Warranty)* 49.
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8630 Isobar Ultra 6 *(diagnostic circuitry)* ..... 52.
9312 BC500 Power Backup ..... 219.
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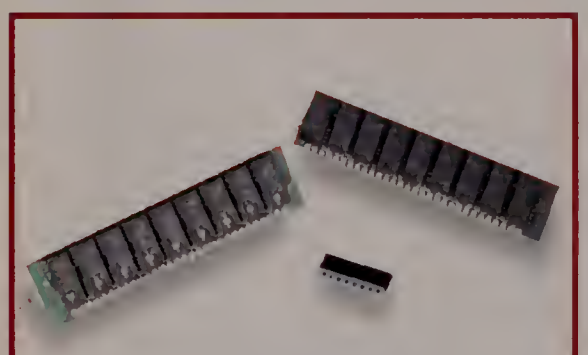
1178 Ext. 2400 Baud w/9600 Baud Fax Modem 92.
1494 Ext. 9600V.32bis... 195. 3075 Int. ... 195.
3574 Ext. 2400 Baud V.42/9600 Baud Fax ... 115.
3386 FaxModem AFC *(2400 baud 96S/48R)*.. 59.
4430 FaxModem AFX *(2400 baud 96S/48R)*.. 79.
4429 FaxModem V.32bis 14,400 baud *(int.)*. 219.
4428 FaxModem V.32bis 14,400 baud *(ext.)* 259.
7921 Pocket FaxModem ..... 87.



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Bring out the power of Windows or any number of applications by boosting your memory.
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6502 Insider 90 PRO 579. 6501 Dual 90 PRO 1479.
6343 PC Powered 90 *(incl. PC2B & cart.)*..... 499.
6344 PC Powered 90 PRO *(incl. PC2B, cartridge & Central Point Software)*..... 599.
2500 PC2B-2 Controller ..... 149.
2530 90 MB Cartridge.. 149. 2467 Tripak .. 439.
8480 Tape250 Insider Tape Backup ..... 239.
8481 Tape250 Inside Half-Height Tape Bckp 259.
8482 Tape250 PC Powered Tape Backup.... 359.
Mountain Network Solutions ... 2 years
3812 FS8500 IDE Tape Backup *(304 M)*..... 499.
6153 DC2120 Tape Cartridge *(5 pack)*..... 149.
NEC ... 2 years
6577 CDR37 Portable CD-ROM Drive ..... 399.
6582 CDR74 Portable CD-ROM Drive ..... 589.
6581 CDR84 for PC/XT/AT ..... 499.
7023 MPC Upgrade Kit *(with CDR37)*..... 949.
7021 MPC Upgrade Kit *(with CDR84)*..... 1079.

Pacific Rim ... 1 year
1304 1.2 MB External *(for any parallel port)* $239.
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Quantum ... 2 years
8304 Plus Hardcard II XL 50 MB *(9 ms)*..... 225.
8287 Plus Hardcard II XL 105 MB *(9 ms)*..... 389.
Summit Memory Systems ... 2 years
6436 SE120 Tape Backup ..... 215.
TEAC ... 1 year
6951 1.2 MB Drive for AT..... 65.
4670 1.44 MB Drive for PC/XT *(3½")* ..... 59.
4326 1.44 MB Drive for AT *(3½", w/Bastech)* 75.
4414 3½"/5¼" Dual Floppy Drive ..... 145.

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6556 256k DRAMs *(100 ns, set of 9)* ..... 19.
5510 1 MB x 9 SIMMs *(80 nanosecond)*..... 45.
2497 4 MB x 9 SIMMs *(80 nanosecond)*..... 139.
5746 1 MB Chips *(80 ns, set of 9)*..... 45.

IOMEGA ... 1 year
6343 *PC Powered 90*—Lowest priced Bernoulli drive ever in one complete, convenient package. Includes 90 MB cartridge, PC2B interface card, and cable..... **$499.**
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Tape250—QIC & Irwin compatibility in one affordable tape drive! Stores 250M & includes data compression & *Central Point Backup*.
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2214 3½" DS Disks*(10)*.... 9. 2242 *(50)*..... 32.
2215 3½" HD Disks*(10)*.. 15. 2241 *(50)*..... 59.
2239 3½" HD Color Disks *(Qty. 10)*..... 16.
2243 3½" DS Color Disks *(Qty. 10)*..... 10.
Sony ... lifetime
3292 5¼" HD Disks*(Qty. 10)* ..... 11.
3297 3½" DS Disks *(10)*..... 9. 6148 *(30)*.. 25.
3298 3½" HD Disks *(10)*... 15. 6375 *(30)*.. 42.
8185 QD2040..... 14. 1895 QD2120..... 21.

3M ... lifetime
3943 DC2000..... $17. 1581 DC2120..... $22.
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IF YOU CAN'T WAIT FOR SLIDES BUT WANT TO SHOW COLOR OUTPUT ON THE BIG SCREEN, THESE 27 LCD PANELS PROVIDE AN ATTRACTIVE ALTERNATIVE TO TRANSPARENCIES.

BY DANIEL TYNAN

Color LCD Projection Panels

Overhead transparencies are all well and good, but until you've created an on-screen slide show, you haven't really used your presentation package. When you display those once-static slides on a monitor, you can animate charts and graphs, add cinematic effects like wipes and fades between slides, even stop the show in the middle to finesse numbers in a spreadsheet. You can't do that with 35mm slides. The problem comes when you want to wow more people than can fit in front of your monitor. That's when you need an LCD projection panel.

An LCD panel is like a slim, see-through version of your monitor. Plug it into your PC's video port, place it on top of an overhead projector, and voilà—instant crowd pleaser. Most LCD panels provide VGA-quality visuals or better; many also let you project

full-motion images from TVs, VCRs, and other video sources. Perhaps best of all, LCD panels are highly portable, especially when compared with large-screen color projectors. The popular Barco projectors, for example, average a porcine 118 pounds and require the services of an A/V technician to realign the lenses every time they're moved.

Several LCD vendors also sell portable projection systems that combine an LCD panel with a built-in light source, so you don't have to rely on the quality of the overhead projector at your destination. But you wouldn't want to drag one through an airport—at 18 to 40 pounds, these units are about two to four times heavier than the heftiest panel here. Color LCD panels give you the best combination of portability and performance.

What to Look For

You should never buy an LCD panel sight unseen. A panel that's fine for projecting color text charts may do a poor job of reproducing flesh tones in scanned photos. Insist on a live demo, using the kind of images you'll typically produce.

To help narrow your choices, we've rounded up 27 full-color LCDs, both passive- and active-matrix models. Active-matrix LCDs provide faster response times and better-looking images, but they're more expensive.

MICHAL VENERA

Dolch's Prism doubles as a color monitor.

For a rough idea of image quality, look at the LCD's resolution, color palette, and contrast ratio. All the panels support resolutions of 640 by 480, but only In Focus's 7600XGA gives you 1024 by 768. While an LCD won't increase the number of colors your graphics card can display at one time, the more colors the panel can produce,

LCD Panels: Visuals Hit the Big Screen

● = Yes
○ = No

Vendor	Product	Price	Active matrix	Number of colors [1]	Response (ms)	Contrast ratio	Weight (pounds)	Video input	Dual monitor	Remote controls	Warranty (years)	Reader service number
3M	Model 4100	$2995	○	16	180	15:1	9	○	○	[2]	1	602
	Model 4800B	$5595	○	24,000	150	25:1	9	○	○	[2]	1	602
	Model 5800	$9495	●	227,000	50	200:1	6	●	○	●	1	602
APOLLO AUDIO VISUAL	Vision 16.7	$7595	●	16.8 million [3]	30	100:1	5	[2]	●	[4]	1	603
	Vision 2197	$4325	○	2000	100	20:1	12	○	●	●	1	603
CHISHOLM	TFT Rainbow	$4295	●	2000	30–50	60:1	5	○	●	[2]	1	604
	TFT Rainbow HD	$5295	●	614,000	30–50	60:1	6.8	○	●	[2]	1	604
DOLCH COMPUTER	Prism [5]	$8495	●	185,000	< 40	60:1	7	●	○	●	2 [6]	605
DUKANE	MagniView 492	$5795	●	117,000	60	60:1	6.6	○	●	●	1	606
	MagniView 494 [7]	$6995	●	117,000	60	60:1	6.6	●	●	●	1	606
IN FOCUS SYSTEMS	7600XGA	$7995	○	24,000	150	15:1	7	○	●	●	1	607
	7000FX+	$4495	○	24,000	150	25:1	7	○	●	●	1	607
	PC Viewer 1600LC	$2695	○	16	150	15:1	5.9	○	●	○	1	607
	TVT-3000	$5995	●	262,000	30	100:1	7	[2]	●	●	1	607
NOVA	ASK Impact 16.7	$6595	●	16.8 million [3]	30	100:1	4.8	[2]	●	○	1	608
NVIEW	MediaPro	$7995	●	262,000	30	60:1	8.75	●	●	●	1	609
	ViewFrame Spectra	$5495	●	4000	30	60:1	6.7	[2]	●	●	1	609
	ViewFrame SpectraPlus	$5995	●	185,000	30	60:1	6.7	[2]	●	●	1	609
PROXIMA	ColorWorks	$4995	○	24,000	100	24:1	6	○	●	●	1	610
	ColorWorks sx [8]	$3995	○	24,000	100	20:1	6	○	●	●	1	610
	Ovation	$8495	●	227,000	30–50	200:1	6	●	●	●	1	610
	Ovation sx	$6195	●	24,000	30–50	100:1	6	[2]	●	●	1	610
SAYETT TECHNOLOGY	DataShow 256C	$4295	●	343	30	100:1	7.1	○	[2]	●	1	611
	DataShow Premier	$5495	●	4000 [9]	30	100:1	7.1	[2]	[2]	●	1	611
SHARP	QA-1050	$6500	●	185,000	50	60:1	6.7	[2]	●	●	1	612
TELEX	MagnaByte 1000	$3995	●	2000	30–50	100:1	5	[2]	●	●	1	613
	MagnaByte SC	$4995	●	600,000	30–50	100:1	6.2	[2]	●	●	1	613

[1] Figures rounded to nearest thousand where applicable.
[2] Extra-cost option.
[3] With 24-bit graphics card.
[4] Set at factory; no adjustments required.
[5] Also operates as stand-alone monitor.
[6] Includes free on-site service and one-year parts warranty.
[7] Comes with 2-inch 800K drive for storing images.
[8] 9-inch diagonal (vs. 11 inch for ColorWorks).
[9] More than 256,000 colors for VCR input.

For more information about all products in this table, circle reader service no. 903.

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For one thing, Crosstalk for Windows' long-standing reputation as a mature, stable product. It has what *InfoWorld* called "tremendous connectivity options." The most popular protocols and emulations, like ZMODEM and VT™ 320. The ability to transfer data within Windows through Dynamic Data Exchange. As well as support for shared modems on LANs via NASI/NACS and INT14, for 16550A UARTs, and for speeds up to 57,600 bps.

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In their recent review of Windows comm software, *InfoWorld* wrote that when they called us, their "calls were answered immediately by a capable and well-informed technician." On the other hand, they called the makers of Procomm Plus "more than 30 times in two weeks. All we ever got was a busy signal." With Crosstalk for Windows, you not only get a product that people talk *about*. You also get people to talk *to* if you need help.

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Circle 62 on reader service card

SEE US AT COMDEX BOOTH # 4206

the closer it will come to matching the original image. For simple charts, a 16-color model may suffice, but if you plan to show scanned photos, you'll want at least 5000 colors.

A contrast ratio of 25:1 means that the panel's lightest pixel is 25 times brighter than its darkest; the higher the ratio, the better the picture. But the gulf between specs and reality can be vast. Use these figures for ballpark comparisons, and judge with your own eyes before you buy.

Response time measures how quickly the panel turns each pixel on and off. Response times of 100ms to 150ms should keep your cursor from disappearing when you move the mouse on the screen. For fast-action animation or full-motion video, you'll need a response time of 50ms or less.

The gulf between specs and reality can be vast: Judge with your own eyes before you buy.

Other issues to consider are portability and device compatibility. All these panels are slim enough to slip into a briefcase, and they range from 5 to 12 pounds. Video compatibility, essential if you plan to use live-action footage in your shows, typically costs extra. Many panels let you hook up a second monitor so you can watch your screen while your audience watches the projection. A hand-held remote lets you control the panel—and sometimes the PC itself—from the front of the room.

Some of the panels in this guide offer more than just show. Dolch Computer Systems' Prism panel leads a double life. An ordinary LCD panel by day, it also lets you snap in a backlight cartridge so you can use it as a stand-alone color monitor for your desktop or traveling computer. Dukane's MagniView 494 features a 2-inch floppy disk drive; you can save a presentation to disk and run it without ever having to hook it to a computer. Each 800K disk holds approximately 40 slides.

At $3000 to $10,000, full-color LCDs aren't red-hot bargains. But with most 35mm slides costing $15 or more, an LCD panel can prove cheaper in the long run, plus you won't have to wait for your slides to come back from the service bureau. More important, it will help your presentations stand out in a crowd—and isn't that what this stuff is all about?

Daniel Tynan is a contributing editor for PC World.

WHERE TO BUY

3M
800/328-1371

Apollo Audio Visual
516/467-8033

Chisholm
800/888-4210

Dolch Computer Systems
408/957-6575

Dukane Corp.
708/584-2300

In Focus Systems
800/327-7231

Nova Corp. Int'l
716/647-6510

nView
800/736-8439

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800/678-7469

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201/529-8731

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PCW-11/92

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and ask for infopak A66. It's got everything you need to know about AutoSketch for Windows . . . including the kitchen sink.

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Circle 12 on reader service card

Compudyne™. Latest Technology. Highest

Compudyne is the PC manufacturing and direct marketing arm of CompUSA™, the Computer SuperStore (NASDAQ symbol; CUSA)—inventors of big volume, deep discounting PC retailing, and the largest chain of computer super stores in the country. Compudyne manufactures top quality, fully-supported computers as available from only the largest PC manufacturers at prices typically found only at garage shop clone houses.

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Notebooks

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Notebook	CPU	RAM (MBs)	HD (MBs)	Battery Life (Hrs)	Price
386SXL/25	386SXL-25 MHz, Optional 80387SX	2 standard, 4 & 6 optional	80	3+	$1,599 $59/mo*
386SL/25	Intel 80386SL-25 MHz, 64 K CPU cache Advanced SL power mgm't, Optional 80387SX co-processor	as above	80	3+	$1,799 $67/mo*
486SX/25	Intel 80486SX-25 MHz, Built-in 8K CPU cache	4 standard, 8 & 20 optional	80	2.5+	$1,999 $74/mo*
486DX/33	Intel 80486DX-33 MHz, Built-in 8K CPU cache	as above	130	2.5+	$2,899 $107/mo*

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- Internal FAX/Modem: 9600 bps send/receive fax; 2400 bps modem; inc. WinFax and Quicklink Software.
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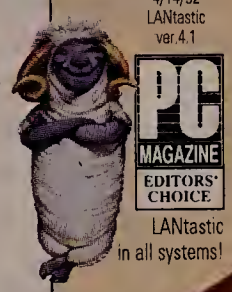
intel inside



all NEW!

Desktop	CPU	RAM (MBs)	HD (MBs)	Floppy	Display	Price
386DX/33	Intel 80386DX–33 MHz	1 standard 32 max	40	1.2 or 1.44	16 bit SVGA card, 14" 640x480 VGA Color Monitor	$849 ** $32/mo*
386DX/33 or 486SX/25	Intel 80386DX–33 MHz or Intel 80486SX–25 MHz, w/built-in 8K CPU cache	2 standard 32 max	80	as above	as above	$999 $37/mo*
486SX/25	Intel 80486SX–25 MHz Built-in 8K CPU cache	as above	80	1.2 & 1.44	16 bit SVGA card, 14" 1024 x 768 SVGA Color Monitor	$1,199 $44/mo*
386DX/33 CACHE	Intel 80386DX–33 MHz 64K CPU cache	4 standard 32 max	120	as above	16 bit SVGA card & Hi-Color Support 14" 1024 x 768 SVGA, .28 Interlaced Color Monitor	$1,399 $52/mo*
486SX/33	Intel 80486SX–33 MHz 8K CPU cache	as above	120	as above	as above	$1,499 $56/mo*
486DX/33 CACHE	Intel 80486DX–33 MHz 128K CPU cache	as above	120	as above	16 bit SVGA card, 1MB Video RAM & Hi-Color Support, 14" 1024 x 768 SVGA Non-Interlaced Multisync Color Monitor	$1,799 $67/mo*
486DX/50 CACHE	Intel 80486DX–50 MHz 128K CPU cache, True 50 MHz CPU	as above	120	as above	as above	$1,999 $74/mo*
486DX2/66 CACHE	Intel 80486DX2–66 MHz, 128K CPU cache New Double Clock CPU	8 standard 32 max	200	as above	16 bit SVGA, Superfast Windows, Accelerator card, 1MB RAM, 14" 1024 x 768 SVGA Non-Interlaced Multisync Color Monitor	$2,499 $93/mo*

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Circle 14 on reader service card

Here's How

Contents: Help Line 256 | Spreadsheets 262 | Word Processing 268

HELP LINE Q & A

Tip of the Month

WINDOWS' HIDDEN TREASURES: Hidden in your *Windows 3.1* directories are two valuable utility programs that Microsoft gave you but didn't tell you about.

The first, WINVER.EXE, is also the simplest. If you run it from the DOS prompt—either outside of *Windows* or in a DOS prompt session—it will give you your *Windows* version number. Run it with the *File • Run* command from Program Manager or File Manager, and you'll discover whether you're running in enhanced or standard mode.

Even better, there's MSD.EXE—a hidden jewel of a program that could compete with such system information utilities as *CheckIt*. This text-based program gives you detailed information on drives, memory, configuration, and more. Its information on IRQ assignments can help you solve the most baffling peripheral installation problems. You can view the information on screen or print any or all of it in reports. To get accurate information from MSD, run it outside of *Windows* by typing MSD from the DOS prompt while in your WINDOWS directory. If you use the program inside *Windows*, you'll be warned that your information may not be accurate.

—George Campbell
Contributing Editor

Finding Shareware

Q I use *Excel* extensively for budgets, account reports, and data base management. I spend hours creating spreadsheets from scratch. Is there a BBS or other source of ready-to-run programs for *Excel* I can download or purchase?
E. L. Hayno, FPO Miami, Florida

A CompuServe's software library is one of the biggest. There's a slew of free and shareware *Excel* templates, macros, and utilities in the service's MSEXCEL forum. *Excel* can also run most of the WK1-format *1-2-3* templates found elsewhere on CompuServe (notably in the LOTUSA forum—just don't tell them you're an *Excel* user!) and in America Online's hefty software library.

You can also get a list of reputable mail-order distributors of shareware and freeware from the Association of Shareware Professionals. In addition, the ASP offers a disk-based catalog of its members' products. To get both, just circle 669 on this issue's reader service card.

• Assn. of Shareware Professionals
616/788-5131, 616/788-2765 (fax)
Reader service no. 669

A No-Battery Notebook?

Q I feel I belong to a neglected buyer group. My wife and I are frequent travelers and take a computer with us on the road, but we never need to work on airplanes or other places that lack power. We need a 115/230-volt power supply (preferably built-in), but not a battery. Since the computer travels in my suitcase, it could be up to 15 by 10 inches, which would leave room for a decent-size keyboard, but I'd still like it to weigh under 7 pounds. Have you seen such a computer?
J. Nathaniel Marshall
Cambridge, Massachusetts

A We too would be interested in the kind of portable you describe. Unfortunately, we haven't seen one either.

Plenty of laptops would meet your criteria, except they weigh significantly more than 7 pounds. All the notebooks in the 7-to-8-pound range are designed with airline tray tables in mind and have the cramped keyboard you dislike, although some have a port for a full-size keyboard. And all have the battery you don't need.

Until someone targets our neglected niche, your best compromise is to buy a notebook with a passable keyboard and a dual-voltage power supply. You could save weight by leaving the battery at home, but *PC World* laptop gurus TJ Byers and John Diebold strongly recommend you check with the manufacturer first. Some notebooks use the battery to smooth and regulate the relatively "rough" output of the power supply, and running the system without it could damage sensitive electronic parts. Also, that battery does come in mighty handy in hotels where there's no electrical outlet near the phone.

File Conversion Utilities

Q Can you recommend a program that can convert *Enable 2.15* word processing files to *WordPerfect 5.1* format?
Scott M. Brasier, Helena, Oklahoma

A Most word processors have a 'save as ASCII' or 'save as text' option. If your program does and you don't mind losing all formatting (tabs, margins, bold and italic characters, and so on), you can use that option to transfer text between

one word processor and another without purchasing any additional software.

If you want to preserve your formatting, you'll need a third-party file conversion utility. The three listed below all support conversion from *Enable* to *WordPerfect* as well as between dozens of other popular and not-so-popular word processing formats.

Most newer word processors have file conversion filters built right in. For example, *Word for Windows* can read and save files in *WordPerfect* and *WordStar* formats and can also import *1-2-3*, *dBASE*, and *Excel* files. *WordPerfect* comes with a utility (CONVERT.EXE) that can translate *MultiMate*, *WordStar*, *DisplayWrite*, and *Microsoft Word 4.0* files to its own format, but that won't help in your case.

- **AutoWord** $150; White Crane Systems, Inc.; 404/594-8180

Reader service no. 670

- **Outside In** $89; Systems Compatibility Corp.; 800/333-1395, 312/329-0700

Reader service no. 671

- **Word for Word Professional** $149; Mastersoft, Inc.; 800/624-6107, 602/277-0900, 602/970-0706 (fax)

Reader service no. 672

EGA, Okay—386, No Way

Q I am planning to upgrade my present computer to a 386. The models I'm considering offer super-VGA options. I am quite happy with my present card and EGA monitor, however. Is there any reason I cannot move this combination into a 386 system?
Gerald F. Cahill
Belmont, Massachusetts

A Think carefully before buying a 386. Even though a 33-MHz 486DX is nearly twice as fast as a similarly configured 33-MHz 386DX, it should cost you only a few hundred bucks more and includes a math coprocessor. We think the big speed boost is well worth the extra cost. And selling your present system *with* its display adapter and monitor should also help pay for a VGA or super-VGA monitor.

There's no fundamental problem in using EGA. All major applications still include drivers for EGA, Hercules, and CGA boards. Even *Windows 3.1* works with the old standards (though we think it looks awful at CGA resolution). However, there's a possibility your EGA board won't work in the new system. Some EGA boards can't keep up with today's fast 386 and 486 systems. Usually the only way to find out is to try.

Change DOS's Date Format

Q DOS's date display puts the month first, then the day of the month, then the year. I find this very confusing. Can I make DOS display the date as year-month-day or day-month-year instead? What about in *Windows?*
Akira Watanabe, Tokyo

A You can change DOS's date format with the COUNTRY configuration command. Using a text editor, add the line **COUNTRY=002,,C:\DOS\COUNTRY.SYS** to your CONFIG.SYS file. After you reboot, the date will display in the YYYY-MM-DD format you prefer. To make the date format DD/MM/YYYY instead, replace '002' with **003**. Note that programs with built-in date displays may have their own configuration commands (for example, in *1-2-3*, it's */Worksheet•Global•Default•Other•International•Date*) or may not allow you to change the date format at all.

To change the date format in *Windows*, run Program Manager's Control Panel accessory, double-click the *International* icon, click the *Change* button in the Date Format box, and choose your short and long date formats. Note that your DOS sessions under *Windows* remain unaffected by the Control Panel setting and will use the date format set by the COUNTRY command.

Pausing CONFIG.SYS Messages

Q Some programs in CONFIG.SYS display long messages that scroll off the screen before I can read them. Is there some way I can pause them?
Paul Hoffman, Berkeley, California

A Easy—all you have to do is press the <Pause> key at any time. After you've read the messages, press any other key to continue. You can also use <Ctrl>-S to pause or continue system processing.

USER GROUP OF THE MONTH

East Tennessee PC Users Group

The November User Group of the Month is the East Tennessee PC Users Group. This organization publishes a monthly newsletter, which lists the names of volunteers who offer support, and maintains special interest groups for beginners and for users interested in hardware, genealogy, *Windows, WordPerfect, Quattro Pro,* data base design, and desktop publishing.

For more information, contact Anne Ehrenshaft, president, 1345 Oak Ridge Tnpk. #291, Oak Ridge, TN 37830; 615/690-8009. The $20 annual fee is good for the entire family.

LABELED CABLES: I'm often plugging and unplugging cables, but until recently I could never remember which end of the cable connector was supposed to go up. What's more, I wasn't always sure, without looking at the back of my computer (not an easy thing to do), which connector went to which port.

So I made two simple changes that saved me from craning my neck. First, I marked the top of each cable connector with a small dot, so I could easily see which end was up. Second, I took a strip of masking tape, placed it on the top of the computer over the ports, and identified each connector on the tape.

Steve Peyrot
East Tennessee PC Users Group

Hiding a Long E-Mail Address List

Q I often send messages over MCI Mail to a long list of clients. The first thing they see is the mailing list, so they have to page through many screenfuls of E-mail addresses, fax numbers, and street addresses before they get to the message. Is there some way to fix the message so people see only their own address and not everyone else's?
Craig Settles, Berkeley, California

A On MCI Mail, it's easy. After you create the message, just enter **DOC** at the Handling prompt. Then each person on your list will see only one address, his or her own.

On most other E-mail systems, you can send a message via blind copies. A bcc of an E-mail message doesn't list all the recipients, providing a roundabout way to hide a lengthy address list.

NetWare's PRINT Command

Q My 386 is connected to a NetWare LAN. When I try to print a big file using the PRINT command, the job is split into several sections. If I use TYPE *filename* PRN, the job prints okay, but it takes an awfully long time. Can I adjust the CAPTURE command to fix this problem?
Jeyakesavan Veerasamy
Richardson, Texas

A Print-job breakups happen when a program pauses printing for longer than the number of seconds specified in CAPTURE's timeout value. The best way to prevent such breakups is to use NetWare's NPRINT command instead of DOS's PRINT. NPRINT is faster, won't break up print jobs, and won't tie up the printer as long. NPRINT will even send a job to a printer that isn't mapped to an LPT or COM port. Just use NPRINT *filename Q=printqueue* to select the print queue you want to send the job to.

Trading Extended Memory for Upper

Q I have a 386 with 4MB of RAM running DOS 5.0. To provide my applications with as much conventional memory as possible, I decided to load my fax board's large memory-resident utility into upper memory instead of conventional memory. To make room for it, I appended /I=E000-EFFF to the DEVICE=C:\DOS\EMM386.EXE line in my CONFIG.SYS, which created 64K of additional upper memory. But it also reduced available extended memory. Why does making upper memory available to DOS take away the same amount of extended memory?
Regi Soolook, Fairbanks, Alaska

A Let's take a look at what's going on here. In a typical 386 or 486 with 4MB of RAM, the first 640K is conventional memory. The remaining 3456K is extended memory. Add 640K to 3456K, and you get 4096K, or 4MB—all the RAM in your system. If DOS's MEM command reports less 'total contiguous extended memory', your system is probably using some RAM to "shadow" its system and/or video BIOS's. That is, your system has copied the contents of your system and video BIOS's from slow read-only memory (ROM) chips to fast RAM to improve performance.

The 640K of conventional memory occupies the addresses from 0 through 1 byte before 640K, and extended-memory addresses start at 1MB (1024K). Note that none of your system RAM occupies the addresses from 640K to 1024K. This 384K (1024K minus 640K) area, called upper memory, was traditionally reserved for use by system hardware. In most 386s and 486s, the VGA uses two 128K segments of upper memory addresses (hexadecimal A0000 to AFFFF and B8000 to C7FFF), and the system BIOS takes most or all of another 64K (F0000 to FFFFF). Unless some other device (like a network board or hard drive controller) or ROM shadowing also uses upper memory, that leaves two "holes" of unused addresses, B0000 to B7FFF (32K) and C8000 to EFFFF (160K).

A few years ago, developers realized they could run device drivers and memory-resident programs in those holes by mapping extended memory to those addresses, thus freeing conventional memory to load larger DOS applications. This trick used to require a third-party memory manager like *QEMM-386* or *386Max*, but DOS 5.0's EMM386.EXE utility and its DEVICEHIGH and LOADHIGH commands let you do the same thing. (See the June column for a detailed discussion of configuring memory with DOS 5.0.)

By default, EMM386.EXE scans only the addresses C8000 to DFFFF, looking for unclaimed addresses to which it can map some extended memory. If that entire range is available, mapping 96K of extended memory reduces the amount available by that same 96K. When you add the /I=E000-EFFF include switch, which tells EMM386 to also scan addresses E0000 through EFFFF (the last digits of the addresses aren't used in the switch), EMM386 maps an additional 64K, increasing your system's total upper memory and reducing available extended memory—but the total amount of usable memory (conventional plus upper plus extended) remains the same.

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If your monitor is driven by a CGA, EGA, or VGA adapter and you want more upper memory, you can add /I=B000-B7FF to your EMM386 command. If your DOS apps don't need expanded memory, add the parameter NOEMS after the include switch(es) to gain another 64K.

By Robert Lauriston

Mail your questions to Help Line, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Help Line; CompuServe 75300,3205; MCI Mail, 381-7106; Internet rlauriston@aol.com; or 415/442-1891 (fax).* PC World *pays $50 for published questions. Sorry, we cannot acknowledge unpublished materials.*

Robert Lauriston is a contributing editor for PC World.

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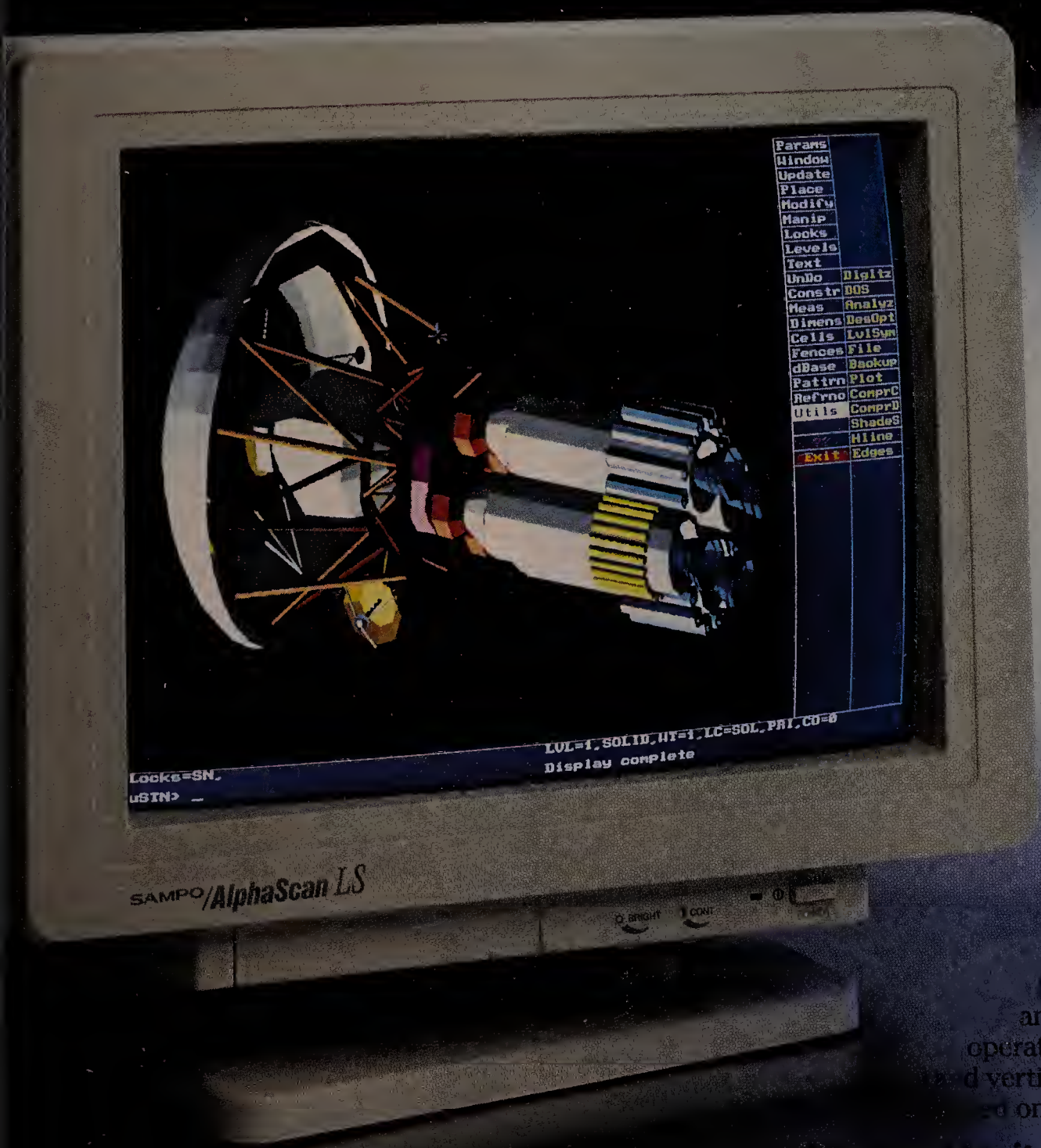

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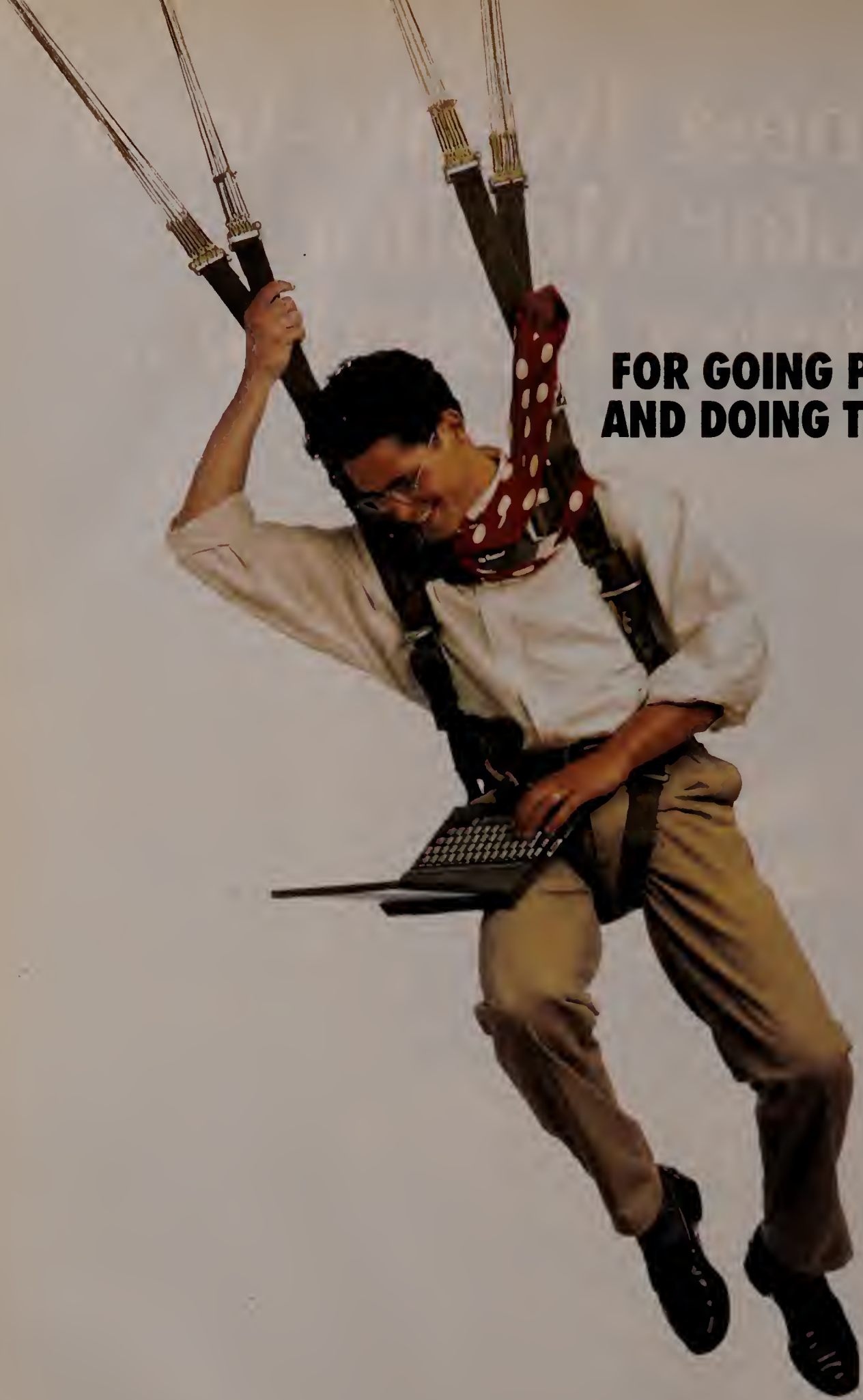

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SPREADSHEETS Q & A

Some Sums in Excel 4.0

Q I've just loaded *Excel 4.0*, which I use for stock portfolio evaluation. Is there an easy way to sum a column of figures while excluding some of the rows that contain subtotals? I use a formula like =SUM(D10+D14+D15), but it's tedious to change the formula every time I insert or delete new rows.
Diane Pearson, Lake Elmo, Minnesota

A The trick is to hide the subtotals, then select only the visible cells in the column. The procedure is the same for *Excel 3.0* or *4.0*. First, assign a name to the subtotals: Select each subtotal row by holding down **<Ctrl>** while you click on the row number in the worksheet frame. Then use *Formula•Define Name* and assign a name like SUBTOTALS to these rows. Before you sum the remaining values, hide the subtotals: Press **<F5>** and choose *SUBTOTALS* to select them, then execute *Format•Row Height*, and click *Hide*.

Now, position the cell pointer at the bottom of the column you want to sum and click the Autosum button Σ (shown here). The range, say C1:C15, appears as the argument in the formula bar. Now press **<Alt>-<Semicolon>** to exclude the hidden rows—the subtotals—from your selection, and press **<Enter>**. To make your subtotals visible again, use **<F5>** to select them, execute *Format•Row Height*, and click *Unhide*.

Make Dates in the Next Century

Q I have attempted to construct a list of dates using the @DATE() function with dates from December 31, 1999, to March 1, 2000, in *1-2-3 for Windows*, *Quattro Pro 4.0*, *Excel 3.0*, and numerous other spreadsheets over the years, with the universal result that every spreadsheet has failed my simple criterion for excellence—the ability to deal with dates into the twenty-first century. I recommend that you withhold your editorial applause for spreadsheet software until you find a spreadsheet with this capability.
A. E. Doughty
Edmonton, Alberta, Canada

A Mr. Doughty's letter appeared in the September *Letters* column, and I feel compelled to offer a response. The DATE function operates the same way in most spreadsheet programs, with a few slight variations. In *1-2-3*, @DATE(92,11,21) yields the code number 33929. When formatted to (D1) format with the command */Range•Format•Date*, this number appears as 21-Nov-92. To calculate a date in the twenty-first century, make the year number greater than 100. @DATE(150,11,21) yields the date number 55113, which formats to 21-Nov-2050. Year date values in *1-2-3* are valid through 199 (year 2099). In *Excel*, you can use year values of, say, 150, which yields the year 2050, but its dates extend only through 2078.

```
B2: +"MYFI"&@IF(@MONTH(@NOW)<10,"0","")&@STRI

        A          B        C        D
1
2   \FILENAME     MYFI0724
3
4   \S            /fs{\FILENAME}~r{esc}
5
```

FIGURE 1: This macro names your 1-2-3 spreadsheet based on today's date, saves it, and replaces any existing file.

Up-to-Date Saves in 1-2-3

Q I've been using the *1-2-3* macro described in February's *Star-Dot-Star* that told how to write a macro to save a spreadsheet file. But the file name is hard-coded into the macro command. For example, the macro statement **/fsMYFILE~r{esc}** saves the current file as MYFILE.WK1 and replaces the existing file if necessary. Is there a way to make the macro save the file with a name that's automatically determined by the current date? For instance, on November 2 it would save the file as MYFI1102.
Kathleen Flaherty, Bradenton, Florida

A It's not difficult to create a macro that uses a variable to create a file name based on the date. Simply use an @IF() function to combine your text with the date. The tricky part is to format the date with all the necessary leading zeros. Recreate the labels in **FIGURE 1**; remember to type an apostrophe in

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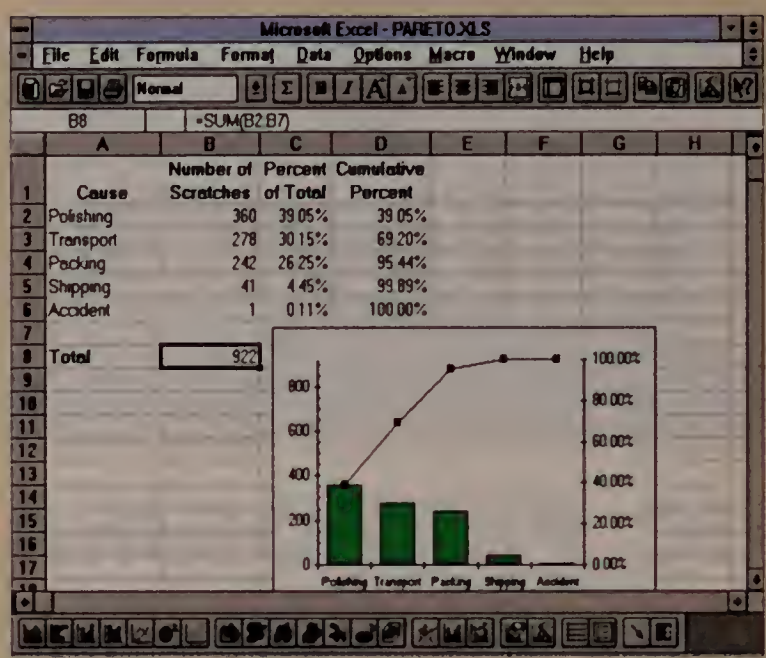
Master Class: Quality Control

Quality control is crucial to any business or service. Your spreadsheet can help you systematically measure, analyze, and then eliminate quality problems. The approach is to create a *Pareto chart* to rank and measure the causes of the problem; then you can instantly see which one to attack first. A Pareto chart (SCREEN 1) is a standard way of presenting such causes and the percentage of the incidents that can be prevented by eliminating these causes. The basic technique works with *Excel, 1-2-3 3.1, 1-2-3 for Windows,* and *Quattro Pro.*

Let's say you're trying to prevent scratches from marring the finish of your company's flagship product, polo mallets. So you've gathered data on the causes of 922 scratches and determined that 360 occurred during polishing, 278 during transportation from the finishing to the packing area, 242 during packing, 41 during shipping, and one when a light fixture fell from the ceiling onto a pallet of mallets.



SCREEN 1: A Pareto chart is an essential quality control tool. It ranks and measures problems so you can easily see which problems merit immediate attention.

In your spreadsheet, enter the labels, data, and formulas that are shown in SCREEN 1. Cell B8 is the sum of B2:B6. The sample data here has already been sorted in descending order, which is a necessary step in creating a Pareto chart. In cell C2, enter the formula B2/$B$8 and copy it to C3:C6. The dollar signs in the formula make B8 an absolute cell address so that all copies of the formula will use B8 in the denominator. In D2, enter =SUM($C$2 C2), and copy it to D3:D6. In this formula, only the $C$2 end of the sum range is absolute; the other end is relative. When you copy the relative cell address, it adjusts so that each copy sums a progressively larger range. For instance, the formula in D3 reads =SUM($C$2:C3), and so on.

At this point, the specific command procedures differ greatly between *1-2-3 3.1, Quattro,* and *Excel,* but the basic technique is the same: First, create a mixed bar-line graph with the frequencies displayed as bars and the cumulative percentage as the line. Assign the line to a second *y*-axis, and scale the bars' *y*-axis with a minimum of 0 and a maximum equal to the sum of the incidents, in this case 922.

Here's how to perform the *Excel* procedure that produced the graph shown in the figure: First, select *Options • Toolbars • Chart* and click *Show.* Select the range A2:B6, hold down <Ctrl>, and add D2:D6 to the selection. Now, click the combination graph tool (shown at right) from the button bar at the bottom of the screen. Draw a box on the worksheet, and click *OK* to select the default. A rough graph appears in the box. Double-click on the graph to edit it.

Use your right mouse button to click on the numbers in the *y*-axis, and select *Axes* from the pop-up menu. In the dialog box, select *Overlay Value (Y) Axis* and click *OK.* Right-click on the left *y*-axis numbers again, select *Scale,* deselect *Minimum* and *Maximum,* and enter 922 (the total number of mallet scratches) as the maximum value. Click *OK,* and your basic Pareto chart is complete.

front of the slashes and backslashes that begin most of the labels. Cell B2 contains the following string formula: +"MYFI"&@IF(@MONTH(@NOW)<10,"0","")&@STRING(@MONTH(@NOW),0)&@IF(@DAY(@NOW)<10,"0","")&@STRING(@DAY(@NOW),0). Once you have entered these labels, use the */Range•Name•Labels•Right* command, selecting A2..A4 as your label range.

The formula begins with the string "MYFI." Then, if the current month is between January and September, the expression &@IF(@MONTH(@NOW)<10,"0","") appends a zero. Then, &@STRING(@MONTH(@NOW),0) adds the number of the month. Finally, &@IF(@DAY(@NOW)<10,"0","")&@STRING(@DAY(@NOW),0) uses the same logic to add the number of the day, with a leading zero for days whose number is less than 10.

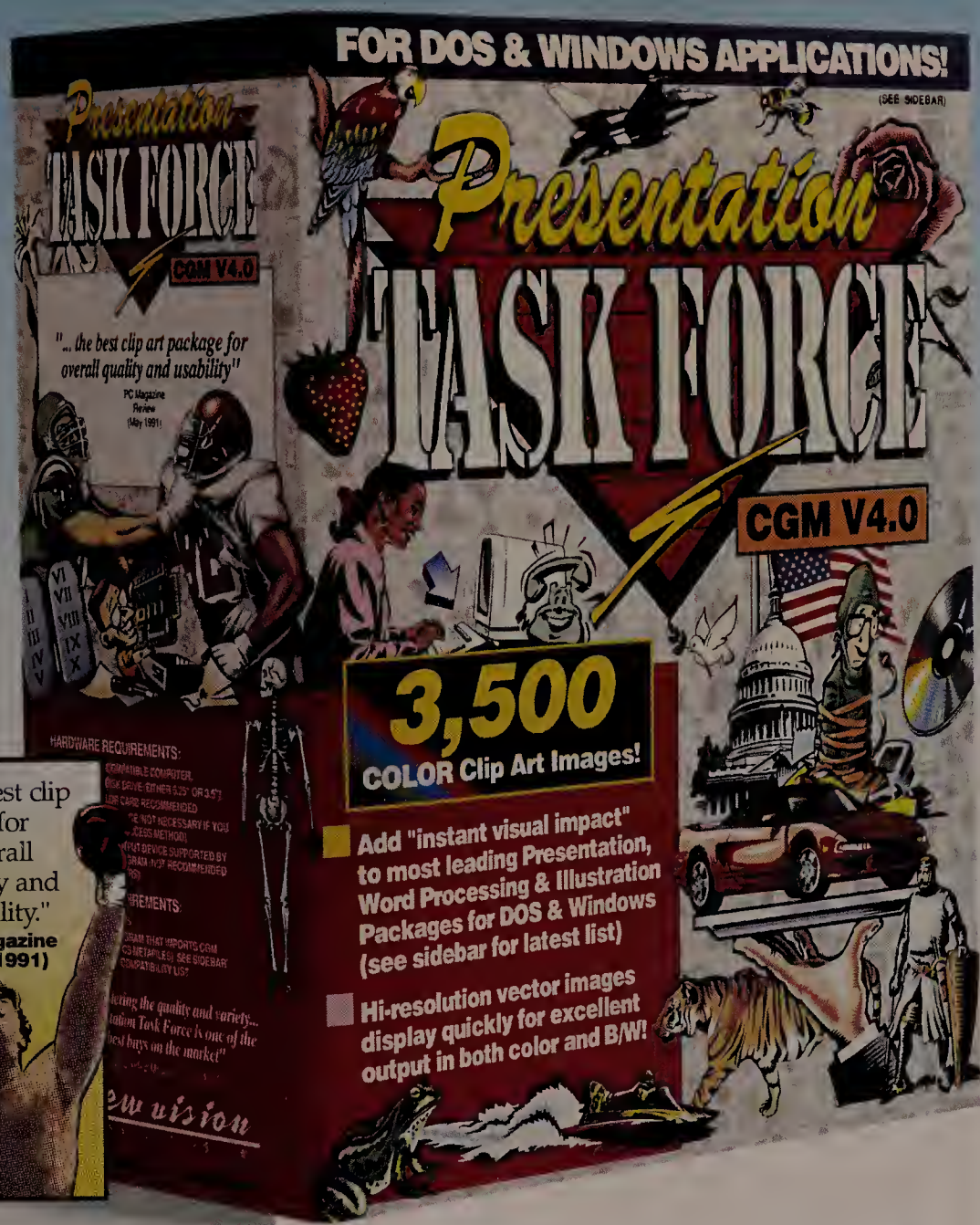
Now for the macro statement in cell B4. In place of the hard-coded file name, there is a subroutine call to the variable cell \FILENAME. After executing */File•Save,* the macro goes to \FILENAME and types out the file name calculated by the string formula. Then, the macro returns to B4 to execute the remainder of the statement.

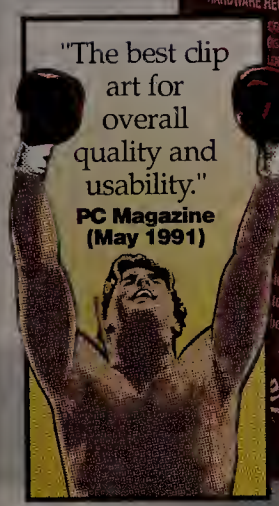
A Better Round by Half

Q I have a set of numbers that I need to round to the nearest half. I know about the @ROUND() function in *1-2-3,* but as far as I can tell, it will round numbers only to the nearest decimal point. Can you tell me how to get the number I need?

Bill Jones, Chapel Hill, North Carolina

A The formula you should use is **@ROUND(*source**2,0)/2**, in which *source* is the range, formula, or other value that you want rounded. For instance, to round the sum of your SALARY range, you'd use **@ROUND(@SUM(SALARY)*2,0)/2**. The formula works by doubling the source number, rounding to the nearest whole number, then dividing the result by 2. Similarly, to round to the nearest quarter, use **@ROUND(*source**4,0)/4**, and so on. This formula will work in *1-2-3, Excel,* and most other spreadsheets.





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USER GROUP TIP

Spreading Text

When you import text files into *1-2-3*, the /File • Import command gives you two options: Text and Numbers. Using the first, each line of text becomes a long label on its own row—but all in one cell, which is seldom useful. The second option, Numbers, puts the numeric strings of each row into separate cells, but it removes the alphabetic characters in the process. This, also, doesn't always prove useful.

Luckily, there are ways around this. One is to put quotes around all the nonnumeric potential cells in your text file, then import it with the *\File • Import • Numbers* command. *1-2-3* treats everything between quotes as a label, so any characters—even letters—between two quotes will go unchanged into a cell. If you have a large file, getting all those quote marks into the right places could be difficult, but the program in which you export your data to ASCII may be able to do it for you. Your word processor's search and replace feature can also help.

If the data in each line is segregated into "fields" that start at the same points in each line, there's a better option. Import the data with the */File • Import • Text* command, then select */Data • Parse*. This command will give you a list of options, all pretty self-explanatory, for separating long labels into columns.

Dave Martin
East Tennessee PC Users Group

Excel-lent Automatic Sort Range

Q I use *Excel 4.0*'s data base feature extensively to manage a 600-record data table. I frequently need to sort the records in this table, but I've found it really inconvenient to select all the data records manually before I can sort. I can't simply select the Database range, since this includes the field names in row 1, and I don't want to sort those. Is there a fast way to select all the records and only the records?
Stepan Renard, San Francisco

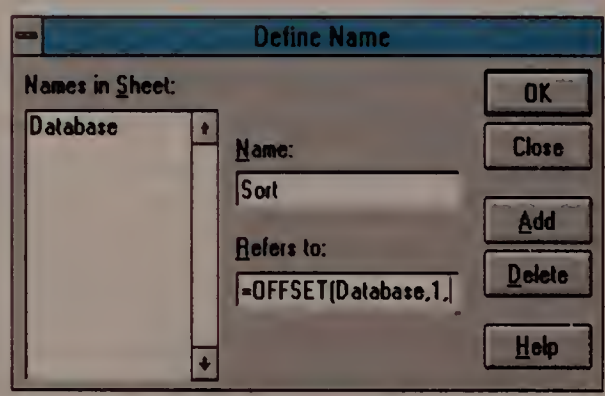
A Yes. *Excel* allows you to create a special range name—let's call it Sort—whose reference is dynamically linked to the Database range. Then, whenever you need to sort the records, you can select Sort.

The range called Database (which is defined when you use the Data•Set Database command) includes the field headings in the top row of the data base, plus all of the records. If you always use the Data•Form command to manage the data, the Database range is automatically redefined as you append and delete records. If you link the Sort range to Database, *Excel* will redefine that range, as well.

To create the Sort range, select *Formula•Define Name*. In the Name field, type **Sort**, then press **<Tab>** to select the Reference field, and enter the formula **=OFFSET(Database,1,0,ROWS(Database)-1)**. Once the formula is entered, click *OK* or press **<Enter>** to close the dialog box. See **SCREEN 2** for an example.

Here's how the formula works: OFFSET is a *reference* function; it yields a range address, which in this case is based on the dimensions of the Database range. In the second argument, the 1 indicates that the top row of Sort is to be one row below the top row of Database. The zero in the third argument means that Sort's leftmost column is the same as Database. The fourth argument specifies that the number of rows in Sort will be the number of rows in Database, minus one. The result is a range that's identical to Database, minus the first row.

To select the records for sorting, press **F5**. Note that the Goto dialog box doesn't display names with formula references, so you have to type **Sort** in the Reference field. Then you can press **<Enter>** and proceed with your *Data•Sort* command.



SCREEN 2: Using the OFFSET () function when defining a name allows you to make one range dependent on another.

1-2-3 Conversions

Q I'm trying in vain to open a *1-2-3* release 3.1 WK3 file in release 2.01. I changed the file extension to WK1, but it didn't help. Do you have any advice?
Subhash Bagga, Canton, Massachusetts

A *1-2-3* release 2.*x* can't read WK3 files, and there's no way to make it do so. Your best bet is to get someone who uses release 3 to do the conversion for you.

From inside *1-2-3* release 3.*x*, it's easy to save a WK3 worksheet in the WK1 format—as long as that file has only one sheet. With the file on screen, select */File•Save*, enter a file name with the **WK1** extension, and press **<Enter>**. *1-2-3* will create a file that co-workers with release 2 can use with no problems.

If your release 3 worksheet has multiple sheets, you can't convert it from within *1-2-3*. Luckily, release 3 comes with a utility, TRANWKS.EXE, that can make this change for you. To convert DATA.WK3 into release 2 files, type **TRANWKS DATA.WK3 DATA.WK1** at the DOS prompt. Each sheet within DATA.WK3 will be copied to a separate WK1 file, with names like DATA0A.WK1 and DATA0B.WK1. That, of course, assumes that DATA.WK3 is in the current directory and TRANWKS.EXE is in either the current directory or one that's referenced in your AUTOEXEC.BAT's PATH statement.

If you can't get help from someone who has *1-2-3* release 3, look for someone with *Excel* or *Quattro Pro*. You can use either of these programs to read a WK3 file and write a WK1.

Edited by Richard Scoville

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WORD PROCESSING Q & A

Spaced-Out WordPerfect Documents

Q I have a problem with *WordPerfect 5.1* that's driving me nuts. I like to single-space my documents, with double spaces between paragraphs and triple spaces between sections. When I start a new section, the three spaces sometimes coincide with a new page; when this happens, *WordPerfect* automatically inserts a blank line at the top of the new page. How can I prevent this? I'm constantly editing the document and changing the page length, so I can't delete the extra space manually.
Karen Honeycutt, Berkeley, California

A *WordPerfect* automatically eliminates a single blank line at the top of a page, but two blanks foul up the works. Still, there's an answer.

Before you enter text in any new document, press **<Shift>-<F8>OPL<Down>1U <Enter><F7>**. Watch what's happening as you enter the keystrokes—you're adding one unit of leading to each Hrt (Hard Return) character you insert when you press <Enter>.

Now when you type your document, let the text wrap normally within paragraphs. To double-space between paragraphs, press <Enter> *once*—the leading will add the second line. To triple-space between sections, press <Enter> twice. That will add the extra blank line. (You'll get perfect printouts, but you won't see the double-spacing on screen.) *WordPerfect* will now eliminate any blank lines at the top of a page.

The Case of the Stubborn Floppy Drive

Q If I save or load a document from a floppy drive, *WordPerfect for Windows* insists from then on that a disk be in that drive, even if I exit the program. If a disk isn't in the drive, an error message says 'Cannot read from drive A:'.
David M. Jones, Condon, Oregon

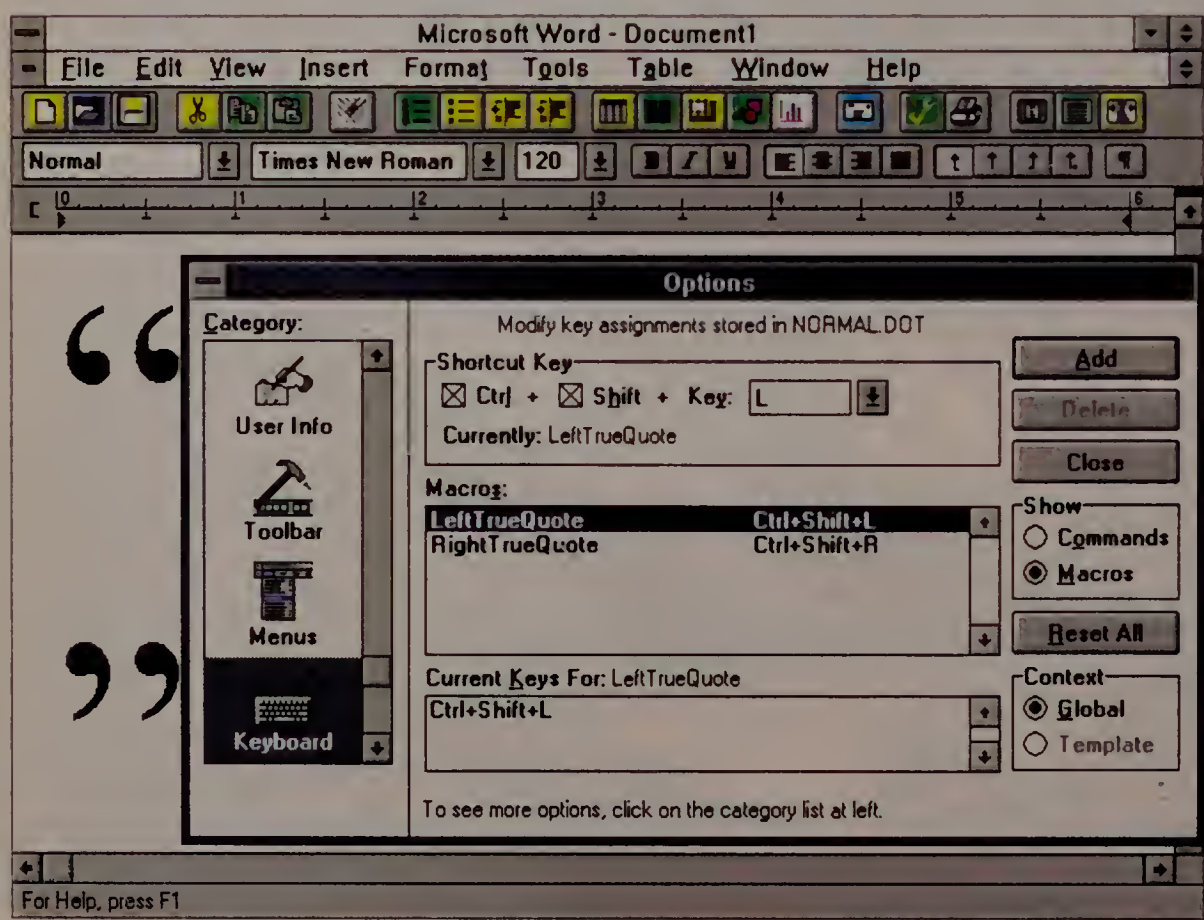
A That's an annoying problem, but one with a quick solution. When you give the *File•Open* or *File•Retrieve* command to load a document on a floppy, look at the bottom left corner of the dialog box. You'll see a check box labeled 'Change Default Dir'. If the box is checked, clear it with a mouse click. *WordPerfect for Windows* will then load the file but won't change its default directory to the floppy drive. Your problems will be over, because the new setting becomes the start-up default.

True Quotes for WinWord

Q I use *Word for Windows 2.0* and would like to use true quotation marks rather than the ugly "inch" character. I tried recording a macro that used the <Alt>-*number pad* keystrokes for the characters, but I couldn't get it to work consistently. Any ideas?
Arek Pfeffer, Corona, California

A Num Lock must be active when you hold down <Alt> and type 0*xxx* on the numeric keypad to create a character. For those of us who like to work with Num Lock off, remembering to turn it on before (and turn it off after) using the <Alt>-*numpad* technique can be troublesome. Fortunately, writing macros in *Word*'s WordBASIC macro language is easy. Here's how to create two for the quote marks you're after:

1. Start *WinWord* with a blank document, then select *Tools•Macro*.
2. Type **LeftDoubleQuote** in the Macro Name field of the Macro dialog box, then click the *Edit* button. You'll see the macro editing screen.
3. Type **Insert Chr$(147)** (147 is the extended character set code for opening double quotes) at the cursor, between the two lines already on screen.
4. Select *File•Close*, then click *Yes* in the query box.
5. Select *Tools•Options*, and press **K** to bring up the keyboard assignment dialog box.
6. In the Shortcut Key field, click both the Ctrl and Shift check boxes, then click inside the Key list box and press **L**. Use another unassigned keystroke, if you'd rather.
7. Click on *LeftDoubleQuote* in the Macros: list, and click the *Add* button. Finish by clicking the *Close* button.
8. Back in the blank document, press **<Ctrl>-<Shift>-L** to test your new macro.



You can use the Tools • Options menu in Word for Windows to assign a macro to the keyboard in this dialog box. You can also assign a macro to the tool bar, or add it to a WinWord menu.

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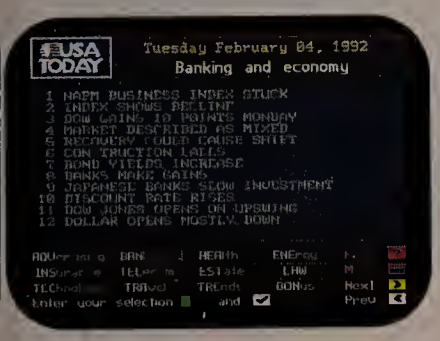

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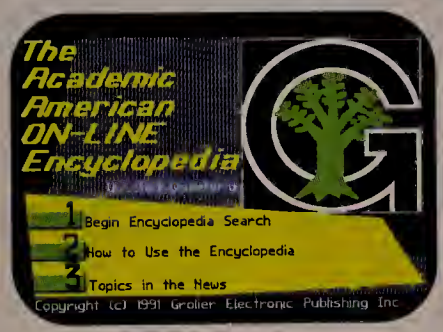

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The left double quotation marks should appear at the cursor (not all fonts have these characters, so if you see something unexpected, switch to another font).

9. Repeat steps 1 through 8, substituting **RightDoubleQuote** in steps 2 and 7, **Insert Chr$(148)** in step 3, and **R** instead of 'L' in steps 6 and 8. The substitutions will create a macro for right-facing double quotes.

10. Finally, back in your test document, choose *File•Exit*. Click *No* when prompted to save the document, but click *Yes* when asked to save glossary and command changes when you exit the program.

Now whenever you use *WinWord*, you can press <Ctrl>-<Shift>-L or <Ctrl>-<Shift>-R to insert true quotation marks in your documents.

Ami Pro Printer Upgrade Woes

Q I've been having printing difficulties with *Ami Pro 2.0* ever since I switched to *Windows 3.1*. When I load an old document, I see the message 'The Printer Driver IBM Proprinters is not installed on this machine. Using default printer' on the screen. I'm still using the same printer, and the documents print out okay, but the message is annoying. Is there any way I can prevent this from happening?

Geoffrey Ayre-Smith, Ventura, California

A This one's easy. *Ami Pro* stores printer information in each document. *Windows 3.1* uses different names for its drivers, so *Ami Pro* thinks that something's wrong. The solution is quite simple. When you load an older document, you'll see the error message. Click *OK* to clear it from the screen, and give the *File•Printer Setup* command. You'll see your default *Windows* printer driver already selected in the dialog box. Just click the *Close* button, then save the document in *Ami Pro*.

Edited by George Campbell

Mail your word processing questions to Word Processing, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Word Processing; George Campbell, CompuServe 71571, 222; MCI Mail, GCAMPBELL; or 415/442-1891 (fax).* PC World *pays $50 for published questions. Sorry, we cannot acknowledge unpublished materials.*

George Campbell is a contributing editor for PC World. ■

POWER TIP no. 265

Slashing WordPerfect Zeros

Here's a *WordPerfect* macro that will slash through a zero when you print it, so no one will mistake it for an uppercase letter O. In a document, press <Ctrl>-<F10>. For the macro name, press <Alt>-0; for the description, type Slashed Zero. Press <Shift>-<F8> and select Other • Overstrike • Create. At the [Ovrstk] prompt, type a zero, then a slash. Press <Enter><F7><Ctrl>-<F10> to stop recording. From now on, <Alt>-0 will put a slash on screen but a slashed zero on paper.

Paul Lang
Burbank, California

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WINDOWS Q & A

Quick-Change Artist

Q I need to switch back and forth between different *Windows* color schemes for a documentation project I'm working on. But to change colors, I have to toggle to Program Manager, double-click first on the Control Panel icon, then on the Color icon, and select the new look from the Color dialog box. Isn't there a faster way to do this?
Tulley Edmonds, Trenton, New Jersey

A Yes, there is. You can easily use an undocumented feature of *Windows 3.1* to access the Color dialog box—or any of the settings in the Control Panel—from a Program Manager icon or a hot-key combination.

The trick is knowing the command-line switches that access the Control Panel's various dialog boxes. For example, to open the Color dialog box, you can select *File•Run* in Program Manager, type **CONTROL MAIN.CPL COLOR** on the command line, and click *OK*.

This command runs CONTROL.EXE—the Control Panel. It also loads the MAIN.CPL file—which contains most of the code used to change *Windows* settings—and instructs it to display the Color dialog box.

When you have the Color dialog box on screen, select the color scheme you want and click *OK*. To speed up the process even more, you can define an icon that runs the command for you.

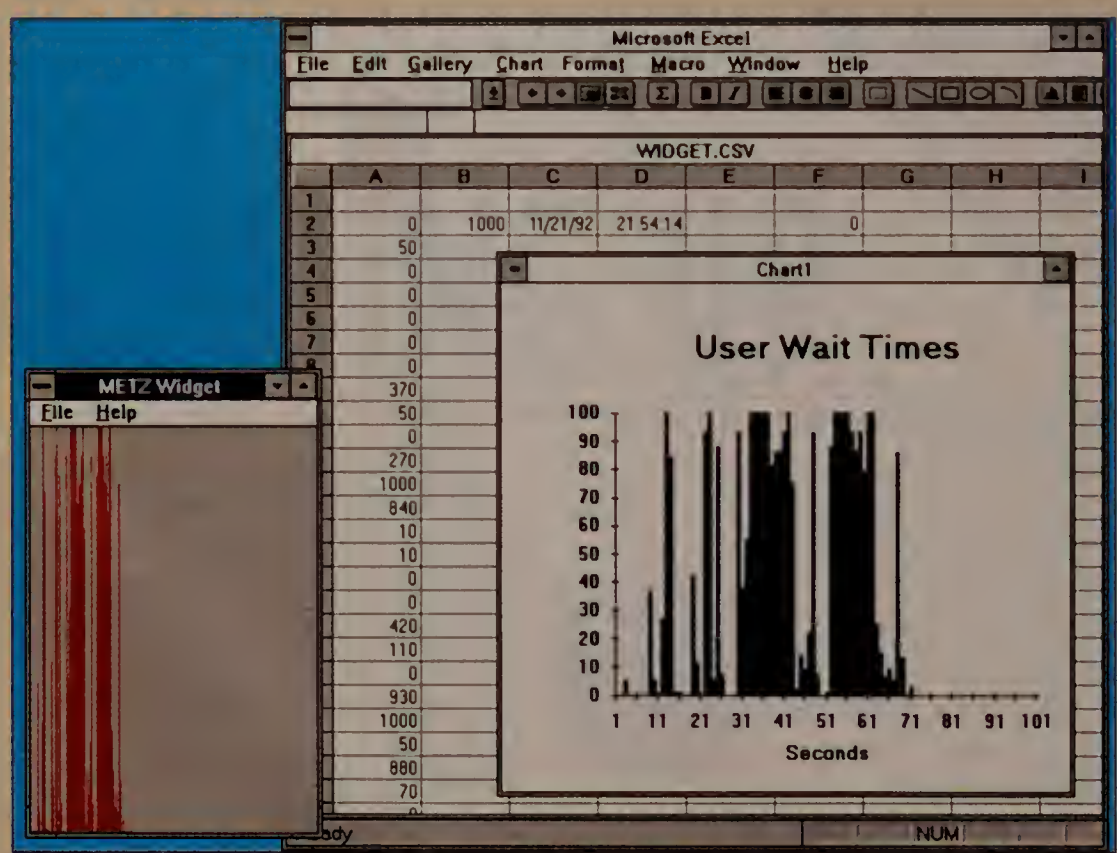
In Program Manager, choose *File•New•Program Item*, type in an appropriate description, such as **Color Scheme**, then type **CONTROL MAIN.CPL COLOR** in the Command Line dialog box. Now specify a hot-key combination to activate the icon. Use the tab key or your mouse to move the cursor to the Shortcut Key dialog box and press **C** (or any other letter you prefer); *Windows* will assign a key combination to that icon so that anytime you're in Program Manager and you press <Ctrl>-<Alt>-C, the Color dialog box will appear. Of course, you could double-click the new icon you've made instead, but hot keys are faster.

Before you click OK, you might as well change the icon to something more descriptive; otherwise, you'll get the generic Control Panel icon. Click *Change Icon*, type **MAIN.CPL** in the File Name box, and click *OK*. You'll see all the icons that normally appear in the Control Panel itself. Double-click on the appropriate one and click *OK*.

This technique works for any of the *Windows 3.1* Control Panel tools included in the MAIN.CPL file: Color, Fonts, Ports, Mouse, Desktop, Keyboard, Printers, International, Network (if a network is installed), and Date/Time. You can access the Drivers and Sound dialog boxes within the Control Panel by typing **CONTROL DRIVERS.CPL** and **CONTROL SND.CPL**, respectively. To activate the 386 Enhanced icon, which appears only if *Windows* is in enhanced mode, the command line should read CONTROL CPWIN386.CPL.

You may find other CPL files in your *Windows* directory if you've installed other configurable drivers, such as MIDI sound hardware. If so, this tip should work with them, too.

Windows Toolbox



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Side-by-Side Windows

Q When I'm doing disk cleanup tasks in *Windows 3.1*, I often want to put two File Manager windows side by side so I can copy files from different directories on the network drive to my hard

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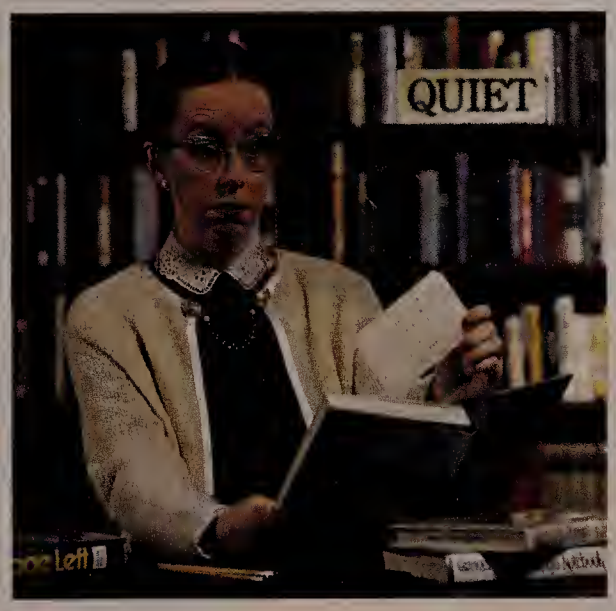

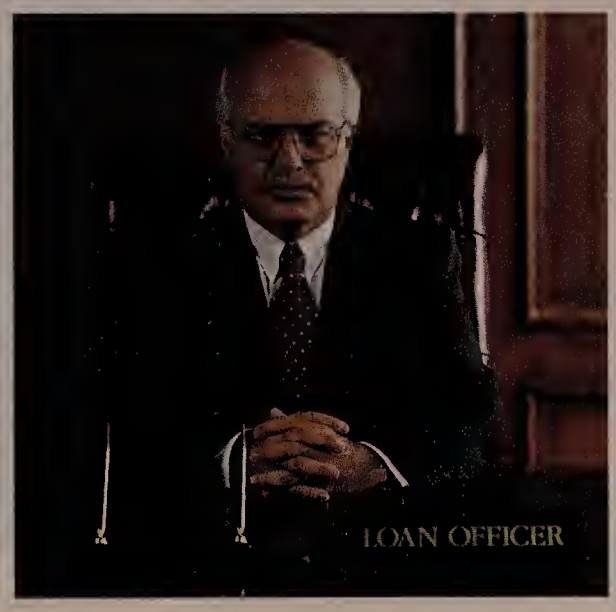

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disk. But when I click Window•Tile, File Manager always arranges the two windows above and below each other, which is much less convenient than side to side. Any suggestions?
William Little, Ann Arbor, Michigan

A It's easy to get two side-by-side drive windows in the new File Manager, though the *Windows* manual won't tell you how. You simply hold down **<Shift>** while you select *Window•Tile*. If you have two or three drive windows open, this key combination will tile them side by side.

Some other undocumented File Manager shortcuts: Hold down the <Shift> key and click a drive icon once to force the current window to display that drive *and* all the subdirectories below the root directory. This takes a little longer because File Manager has to read and display all levels of directories. It can be just the shortcut you need, however, when you know that the directory you want is located somewhere below another directory but you don't remember exactly where.

Double-clicking the System Menu icon (at the left end of the title bar) exits File Manager, but if you hold down the <Shift> key while double-clicking that same icon, you'll save your present File Manager arrangement instead. (The <Shift> key has the same effect when used in conjunction with any other actions that close File Manager, like <Alt>-<F4> or File•Exit.) If you use this secret, you'll no longer need to check the Options•Save Settings on Exit item to save your preferred File Manager window arrangement. The next time you start File Manager, the configuration you saved will reappear exactly as it did when you saved it. (This tip also works in Program Manager to save group window arrangements.)

A Deeper DOS

Q About half of us in my office upgraded to super-VGA monitors recently (I'm in the lucky half), and I like being able to use the extra screen area to run multiple application windows. I've altered my DOSPRMPT.PIF file to allow windowed DOS sessions, but the 25-line DOS window seems so small. Does *Windows* provide a way to increase the number of lines in a DOS window?
Melissa Perez, San Jose, California

A As you've noticed, a 25-line screen looks awfully limited when you've gotten used to a larger *Windows* screenful. Fortunately, both *Windows 3.0* and *3.1* have a way to force your DOS sessions to display more than 25 lines.

In Program Manager, select *File•Run* and type **SYSEDIT**. Click once on the SYSTEM.INI title bar to bring that file to the front, and in the [NonWindowsApp] section add the line **ScreenLines=43.**

Save your changes and restart *Windows*. When you start a windowed DOS session, you should see 43 lines instead of 25. You can also specify 50 lines if that many will fit on your screen.

You may also want to use a smaller font for your DOS session in order to see more lines. *Windows 3.1* provides an easy way to do this. Click the Control Menu icon in the upper left corner of a windowed DOS session. Click the Fonts menu item, and you'll see a list of font sizes to choose from. When you save your changes, *Windows 3.1* will display your windowed DOS sessions in the same size and position every time.

This isn't the only way, however, to change the number of DOS session screen lines. If you're using DOS 5.0, some new commands let you change your DOS capabilities on the fly.

To use these commands, you must have the DOS 5.0 ANSI.SYS driver loaded. If it isn't already loaded, place the line DEVICE=C:\DOS\ANSI.SYS anywhere in your CONFIG.SYS and reboot your PC.

Now when you start a windowed DOS session (or you're at a plain DOS prompt), you can use the DOS 5.0 MODE command to reconfigure the number of screen lines and columns that DOS displays. The command MODE CON COLS=80 LINES=43, for example, forces DOS to use an 80-column, 43-line display.

This command configures your DOS "console" (your monitor, in this case). Other valid options are COLS=40, LINES=50, and, of course, LINES=25 (the DOS default). Your display adapter must support the mode you choose. VGA adapters support 50-line displays, for instance, while the upper limit for EGA adapters is only 43. You can abbreviate the above command, by the way, to MODE 80,43.

Changing the mode in a windowed DOS session under *Windows* immediately changes the size of the DOS window. Changing the mode at a plain, full-screen DOS prompt usually changes only the size of the font that DOS uses.

Changing the mode during a DOS session under *Windows* affects only that one DOS window. Once you exit that session and start another, your windowed DOS sessions revert to the setting you specified for ScreenLines= in your SYSTEM.INI file.

Both Windows 3.0 and 3.1 have a way to force windowed DOS sessions to display more than 25 lines on screen.

On a super-VGA (800 by 600 resolution) display, I find that a 43-line windowed DOS session, combined with *Windows 3.1*'s 5-by-12 DOS screen font, provides the best trade-off of size and legibility. You can even get two DOS windowed sessions running side by side with these settings.

Edited by Brian Livingston

Mail your questions to Windows, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Windows; CompuServe, 74055,412; MCI Mail, PC World Editorial; or 415/442-1891 (fax).* PC World *pays $50 for published questions. Sorry, we cannot acknowledge unpublished materials.*

Brian Livingston, the author of Windows 3.1 Secrets *(IDG Books, San Mateo, California, 1992), leads the Secrets of Optimizing Windows seminar at the semi-annual Windows & OS/2 Conference (CM Ventures, Emeryville, California).*

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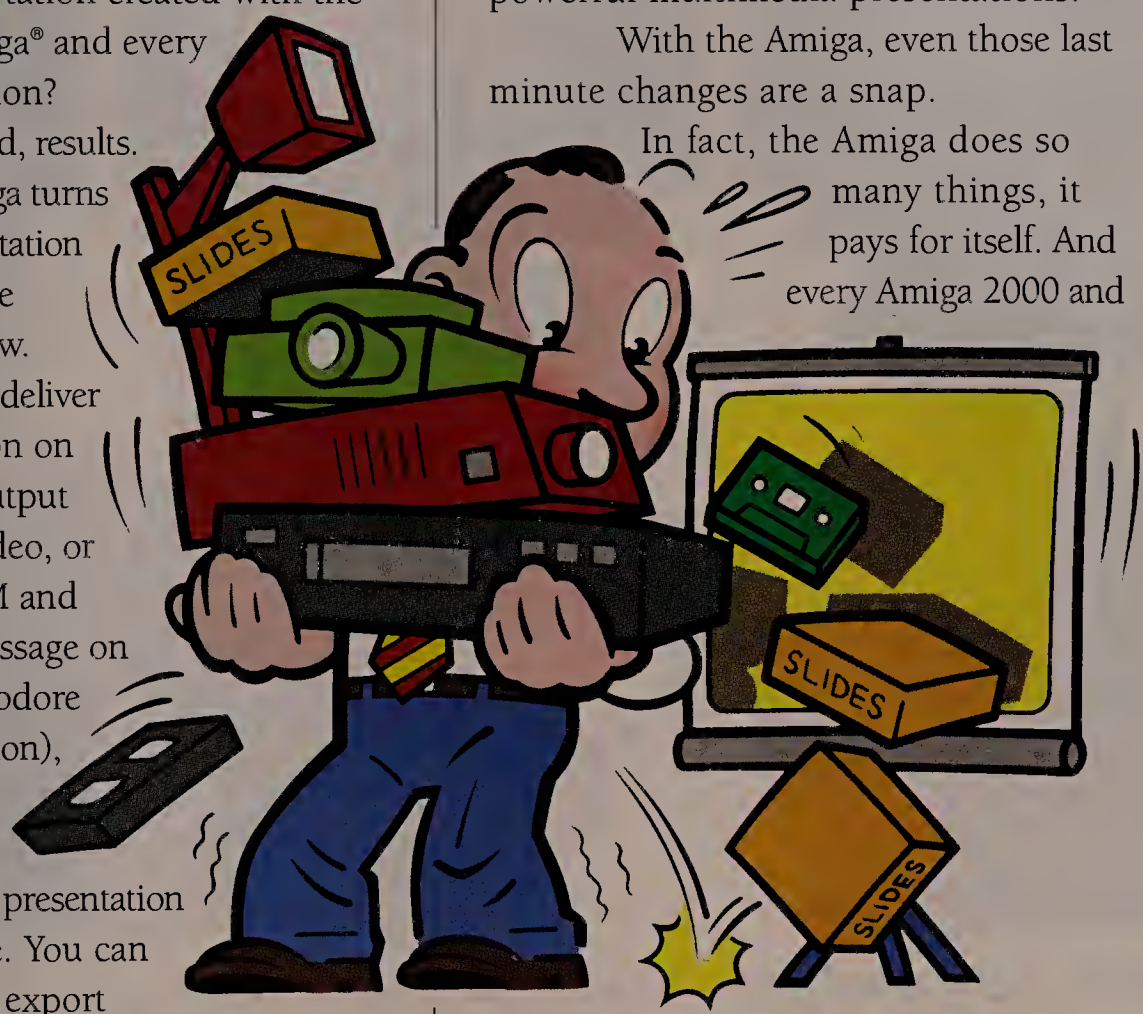

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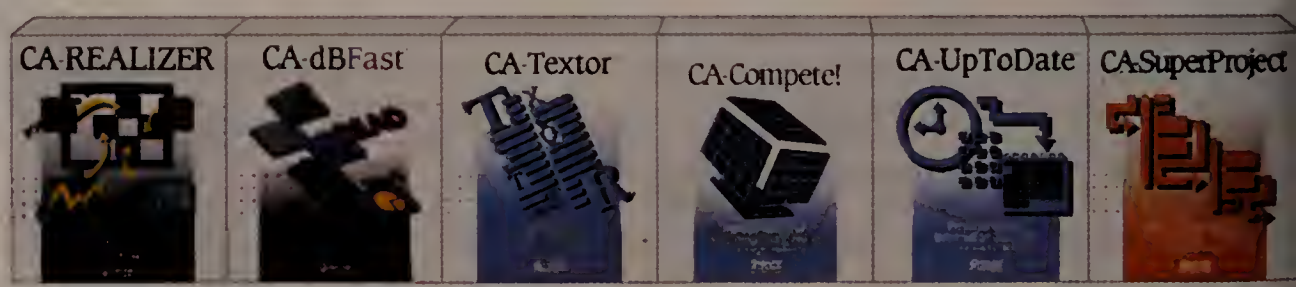

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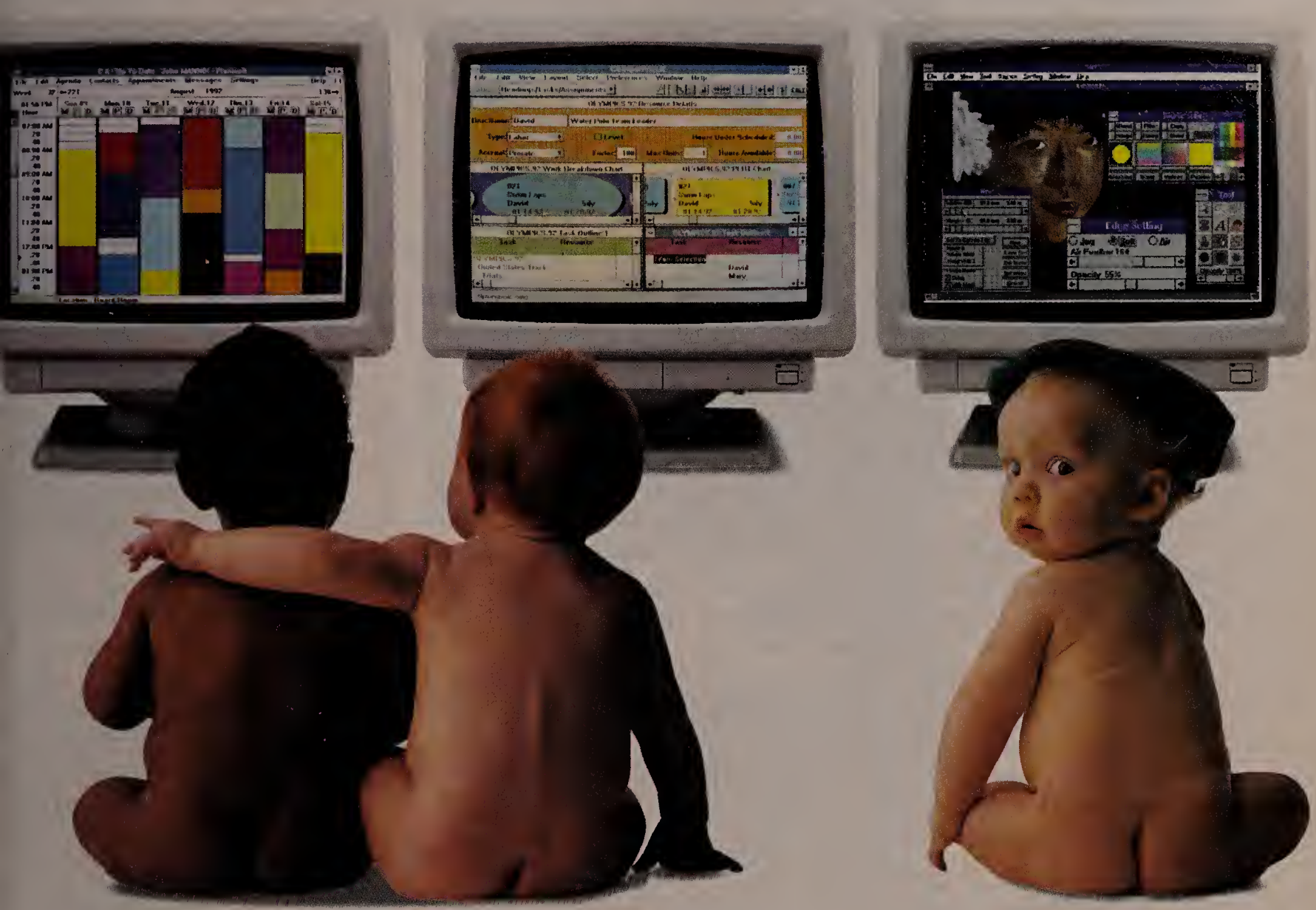

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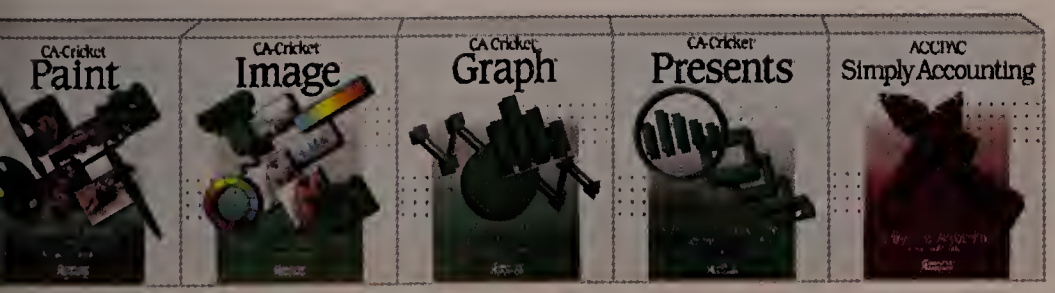

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Circle 39 on reader service card

DATA MANAGEMENT Q & A

Setting Up Your Printer From dBASE

Q Can I send printer control codes from inside *dBASE III Plus*?
Daryll DeWitt, Williamsburg, Ohio

A Whether you're using *dBASE III*, *dBASE IV*, or a clone, you can send control codes to your printer with a short program like this:

```
SET PRINT ON
?? CHR(027) + "(s16.66H"
SET PRINT OFF
```

In this example, the escape code '027' and the quoted text after it change an HP LaserJet's font from Courier to Line Printer. The string in quotes is case sensitive: It has to have a lowercase *s* and a capital *H*.

Little programs like this work, but they're tedious and confusing if you have a lot of them. I wrote a program, PRTCODES, that lets you select printer settings from a list. Here's how to make it work.

First create a data file called **prtcodes** that has two character fields: **Descrption** and **Code**. The lengths of the fields don't really matter, as long as the Code field is big enough to hold the longest string of control codes you might want to use. Once you have set up the file, enter a description and the control codes for your various setups.

When you type in the control codes, enter nontypeable characters in the format *nnn*, where *nnn* represents the character's ASCII code. For example, the escape character (which you will use far more than any other) has the ASCII code 27, so you'd type **\027**. You'd enter a long LaserJet string like '<Esc>E<Esc>&l1o6d3e45' as '\027E\027&l1o6d3e45'. Include a leading zero with two-digit ASCII codes; my program understands '\027', but '\27' will confuse it.

Once you've created the data file, enter the code in **LISTING 1** to an ASCII text file called PRTCODES.PRG. To use the program, type **do prtcodes** at the dot prompt. *dBASE* will then display the list of printer settings in BROWSE mode. Move the cursor to the setting you want and press **<Ctrl>-<End>**. That's it. *dBASE* will send the needed control codes to your printer, and you can continue with your work. If you subscribe to PC World Online, you'll find PRTCODES.PRG in the archive file called NOV.DATA.ZIP.

```
USE prtcodes
BROWSE
pcode = ""
x = code
DO WHILE AT("\",x) <> 0
 pcode = pcode + SUBSTR(x,1,AT("\",x)-1);
      + CHR(VAL(SUBSTR(x,AT("\",x)+1,3)))
 x = SUBSTR(x,AT("\",x)+4,LEN(x)-AT("\",x)-3)
ENDDO
pcode = pcode + x
SET PRINT ON
?? pcode
SET PRINT OFF
```

LISTING 1: PRTCODES lets you change fonts and other printer settings from inside dBASE.

Summarizing dBASE Data for Graphing

Q I'd like to graph some *dBASE* data. What's the easiest way to get the total amount of sales by product into my graphing program?
Veronica Heller, Boston

A Assuming that your graphing program can read DBF files, the easiest method is to sum the data in *dBASE*, create a new file from the results, and use that file in your graph program. If you're using *dBASE IV*, you can accomplish this with the query screen: Type **group by** under your product field and **sum** under your quantity sold field. Choose *Layout•Write view as database file*, and follow the prompts for a file name and optional description. Then press **F2** to create the new file.

dBASE III Plus provides no such elegant way to turn summary information into a new DBF file, so I wrote a program to do it. Copy **LISTING 2** to an ASCII text file: SUMMARY.PRG. The program assumes that your data file is called SALES, that you indexed it by product in an index called PRODUCT, and that it contains fields called Product and Qty_Sold. If your data base somehow varies from this assumption, change the program as appropriate, although it is vital that your data file is either sorted or indexed on the product field.

```
USE Sales INDEX Product
SELECT 2
USE Summary
SELECT Sales
DO WHILE .NOT. EOF()
 mproduct = Product
 sum_sold = 0
 DO WHILE mproduct = Product
  sum_sold = sum_sold + Qty_Sold
  SKIP
 ENDDO
 SELECT Summary
 APPEND BLANK
 REPLACE Product WITH mproduct
 REPLACE Qty_Sold WITH sum_sold
 SELECT Sales
ENDDO
EXIT
```

LISTING 2: This dBASE III Plus program will summarize one data file in another.

Before you run the program, create an empty data file called SUMMARY, with two fields: again Product and Qty_Sold. To run the program and file SUMMARY with data, type **DO SUMMARY** at the dot prompt. If you subscribe to PC World Online, you can find SUMMARY.PRG in the archive file NOV_DATA.ZIP.

Avoiding Q&A Data Entry Templates

Q We use *Q&A* to track mail-order customers. I would like to make sure phone numbers are entered in the format (###)###-####, except when we have a rare overseas customer. Is there a way to have *Q&A* check this, and maybe even fill in the parentheses and

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dashes for U.S. phone numbers, while allowing us to enter international numbers when needed?
Mary Cabrallo, Merced, California

A *Q&A* lets you give each field a *template*, a definition of how the field should look. Templates control the type of characters a user can enter, and can fill in constant characters automatically.

To add a template to a field, go to the main menu and select *File•Design file•Customize a file*. After you specify a data file, choose *Field Template* from the resulting Customize menu. Move the cursor to your phone-number field and type **(###)###-####** (or whatever phone-number format you want). Press **<F10>** to save your change.

For those international numbers, *Q&A* has a hot key that enables you to override a template during data entry. With the cursor in your phone-number field, press **<Alt>-<F4>**, then start typing in your unique numbers. You'll even be able to type over the parentheses and dash.

Getting Labels to Work in Paradox

Q I have been trying, unsuccessfully, to print two-column labels from *Paradox* to my HP LaserJet. The labels I'm using have two columns of labels per page. The problem is that *Paradox* won't print the second column. Turning on the 'Labels' setting makes no difference. How do I tell *Paradox* I need two columns printed?
Joe Green, Oklahoma City, Oklahoma

A If you can print out one column of labels, you're more than halfway there. Assuming your report layout is already set up to print out a label of the proper dimensions, you need to make only a few more changes. First make sure you still have the Labels setting turned on: Inside the report designer, press **<F10>** and select *Setting•Labels•Yes*.

Next, change the page width so it equals the number of characters you can print across one label. For example, if you are using a ten-character-per-inch font and your labels are 4 inches wide, use *Setting•PageLayout•Width* to set the page width to **40**.

To get the extra column to print, make sure there are two page widths in your report layout. In the upper-right corner of the screen (unless you're running *Paradox 4.0*, in which case it's in the lower-left corner), you should see a value such as '1/1'; the second digit shows how many page widths you have. If that number isn't a '2', use *Setting•PageLayout•Insert* or *Setting•PageLayout•Delete* to change it. When the Labels feature is on, *Paradox* will print records in as many columns as there are page widths in the report layout. You don't have to place fields anywhere except in the first page width; *Paradox* handles the rest.

Edited by Celeste Robinson

Mail your questions to Data Management, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Data Management; CompuServe, 74055,412; MCI Mail, 179-3813; or 415/442-1891 (fax).* PC World *pays $50 for published questions. Sorry, we cannot acknowledge unpublished materials.*

Celeste Robinson is a contributing editor for PC World.

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A Technical Perspective For the '90s

A Technical Perspective For the '90s

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1 Introduction

This document is intended to provide end users and developers with an understanding of the capabilities and implementation of the DESQview/X product, along with the DESQview DOS multitasker and the X Window System.

Definitions

X Window System
The X Window System is a hardware-independent and operating system-independent graphics standard designed to operate over a network or within a stand-alone machine. Developed at the Massachusetts Institute of Technology in 1984, it has subsequently become an industry standard employed by companies such as AT&T, DEC, Hewlett-Packard, IBM, Sun Microsystems and others.

X Server
An X Server is a special X Window System graphics application that controls a computer's display screen, drawing windows, text, lines, pictures, circles, polygons and the like according to the requests (messages) from an application. An X Server may handle the screen drawing for multiple applications concurrently - each application typically displaying information with one or more windows on the screen.

X Client
An X Window System application program (such as a spreadsheet or drawing program) that communicates with an X Server is called an X Client. A well-defined messaging system links the two participants. This messaging system may occur over a network or within a single machine.

DESQview/X:

- Is a third DESQview (DESQview, DESQview 386 and now DESQview/X), adding distributed graphics and remote computing capabilities to Quarterdeck's multitasking DOS environment.
- Brings the X Window System to DOS — thereby enabling DOS users to participate in the many graphical and multimedia advances available today only on workstation platforms.
- Allows DOS PCs to participate in industry standard, multivendor, multi-operating system, distributed processing (cross-platform computing).
- Supports the latest advancements in font technologies and advanced memory management.
- Provides printer spooling for DOS PCs as well as remote printing capabilities for Unix X Window workstations and other DOS PCs.
- Gives users of Unix X Window workstations access to many off-the-shelf DOS and Microsoft Windows software packages.
- Gives DOS users access to Unix X Window workstations or mainframe programs (Clients).
- Gives DOS users access to Unix text-based applications (using xterm).
- Gives DOS users access to more powerful DOS and Microsoft Windows programs that are not capable of being run on their own machine.
- Promotes DOS to that of a multiuser system through its remote execution and security features.
- Provides file transfer capabilities between DOS and Unix or other DOS machines on a network.
- Provides developers with an industry standard "open", graphical development environment and choice of user interface.
- Supports industry standard methods for application programs to communicate across a network (Inter Process Communications), regardless of the network type.
- Provides X Client developers and manufacturers access to the huge installed base of DOS machines.

Specifically, it:

- Runs either stand-alone or as a networked system.
- Adds a graphical 3D look and feel to DESQview.
- Provides a growth path from character mode DOS to industry standard graphical user interfaces.
- Gives users a choice of interfaces (window managers) - the DESQview/X, OSF/Motif or OPEN LOOK interfaces are prime examples.
- Dynamically scales the windows of DOS text applications to any size (scalable DOS windows), from just a few pixels to full screen, using scalable font technology.
- Can run applications up to 16MB (16-bit protected mode) or 4GB (32-bit protected mode) by supporting the use of 16-bit and 32-bit DOS Extenders.
- Supports the use of virtual memory and dynamic link library technology to drastically reduce the amount of memory needed to run large application programs.
- Incorporates the Adobe Type Manager and scalable font technology giving X Clients access to the vast array of Adobe Type 1 fonts.
- Allows users to run many off-the-shelf DOS and Microsoft Windows applications in windows side-by-side with local or remote X Window Clients.
- Incorporates a Print Server that can handle print requests from remote machines (both DOS and Unix) connected on a network, while spooling to a printer.
- Allows local users to display and use many off-the-shelf DOS and Microsoft Windows applications that are running on another machine on a network.
- Allows local users to display and use Unix graphical applications (X Clients) that are running on another machine on a network.
- Allows local users to display and use Unix text-based applications that are running on another machine on a network (using the xterm program).
- Allows local users to display and use DOS Clients written for X (graphical applications) that are running on another machine on a network.
- Allows X Window Unix users to display and use many off-the-shelf DOS and Microsoft Windows applications that are running on another DOS machine on a network.
- Provides a multiple level security feature to restrict access to a machine by other remote machines.
- Implements the File Transfer Protocol (FTP) for the peer-to-peer transferring of files to remote machines (DOS or Unix).
- Gives developers a choice of application styles - OSF/Motif, OPEN LOOK and others - or the freedom to design their own.
- Implements a printer imaging model that mimics X Window System display output so that X Clients need only support a single imaging model for both display and printer output, greatly simplifying the coding of X Clients.
- Implements the Berkeley Socket interface, providing Inter Process Communications between separate applications (on the same machine or even across a network) that is independent of the underlying network type.
- Provides developers a platform to port X Clients from Unix to DOS.
- Allows developers to create X Clients in a DOS environment for later porting to other operating systems using the X Window System.

The purpose of this document is to explain how the features of DESQview/X are possible. It provides coverage of the DESQview DOS multitasker, the X Window System and the integration of both of these technologies. This document also describes the development processes necessary to create X Client graphical applications for DOS.

2 DESQview and PC Fundamentals

This section describes the fundamentals of the DESQview multitasking software and basic PC concepts. Readers familiar with these topics are still encouraged to read the information presented here.

2.1 Introduction

DESQview is a program that extends DOS (either PC-DOS,MS-DOS or DR DOS) into a fully pre-emptive multitasking system. Contrary to popular belief, DESQview can perform multitasking on *all* classes of processor - 8088, 8086 (PC-XT), 286 (PC-AT), 386 and 486. However, the technical advances of the later processors empower DESQview with greater capabilities.

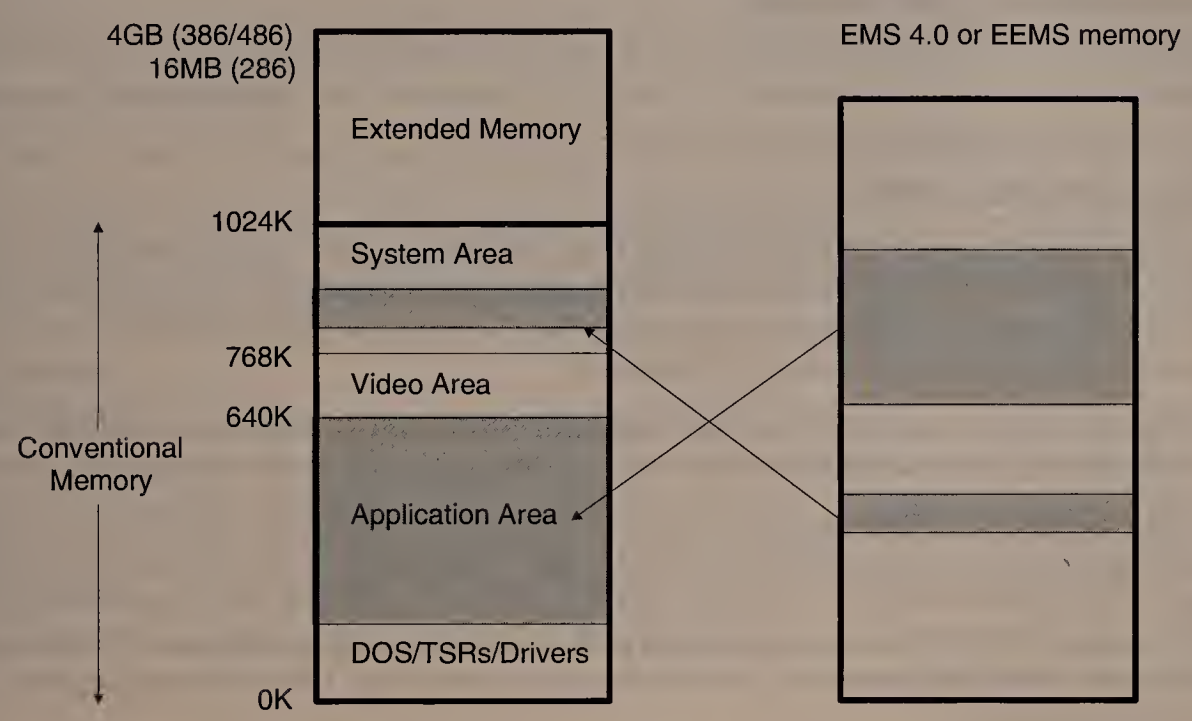
DESQview is compatible with most current PC software - and can even run Microsoft Windows 3.0, 3.1 along with Windows programs, GEM-based, as well as other graphic programs simultaneously.

A program in the DESQview environment may run occupying the whole display screen, or can appear in a small window, framed by a border. Multiple applications may appear on the screen simultaneously, each in its own window.

Certain applications may run in a small window and in "background", depending on how the program has been written and the type of processor being used - a table later in this section summarizes specific capabilities.

2.2 The PC Memory Map

A brief explanation of the architecture of a PC's memory map is beneficial to the understanding of this document. A PC's memory is laid out as follows:



2.2.1 Conventional Memory

Conventional Memory is memory that resides from 0K to 1024K (1MB). DOS, TSRs (Terminate and Stay Resident programs) and device drivers are loaded at the bottom of this memory with video RAM being located between 640K and 768K. Between the top of DOS and the bottom of video memory is the **Application Area.** Above the video area and below the top of conventional memory (1024K) is the **System Area** or what Quarterdeck refers to as High Memory. The System Area contains, for example, special system code such as the machine's BIOS (Basic Input/Output System) or RAM for a hardware card. Typically, this area is not contiguous, but contains portions of unused address space, sometimes more than 128K in size. See Quarterdeck's Manifest User Manual for a detailed description of High Memory (System Area).

2.2.2 Extended Memory

Extended Memory is memory that resides from 1MB and upwards (up to 16MB on a 286, 4 Gigabytes on a 386/486). It is available on machines that use a 286 processor or better and hence is not available on 8088/8086 machines. To be able to directly access this memory the processor must be in a special mode called **protected mode.** This mode is incompatible with DOS and DOS applications which run in **real mode.**

2.2.3 Expanded Memory

Expanded Memory is memory that acts as a "pool" of memory which, under the control of a special program (the **Expanded Memory Manager**), can be "mapped" into one or more conventional memory areas. **Mapping** is a process whereby a portion of expanded memory "appears" at a specific memory location through the use of special hardware (or in certain circumstances via software control - see the section titled "Software Emulation of EMS Memory"). Note that no transfer of data is actually performed - EMS memory is a bank-switch type of system (and hence very fast).

Unlike extended memory, expanded memory is available for all processor types. There are 3 different types of expanded memory, EMS 3.2, EEMS and EMS 4.0.

2.3 EMS 3.2

EMS 3.2 can only map four 16K pages of memory (64K) into conventional memory at a time, typically into a 64K area within the System Area called the **EMS Page Frame.** EMS 3.2 memory is essentially limited to enhancing the data handling capabilities of a program and has been superseded by the other two types of expanded memory.

2.4 EEMS and EMS 4.0

EEMS and **EMS 4.0** memory can map multiple pages of varying size into conventional memory enhancing both data access and program execution capabilities - a far more flexible scheme than EMS 3.2. Note, however, that some EMS 3.2 memory boards were packaged with a 4.0 Expanded Memory Manager. Unfortunately, this gives the user an impression that EMS 4.0 memory is available with these boards, when only 3.2 capabilities are.

Note that for the remainder of this document, all references to EMS 4.0 memory are also applicable to EEMS memory.

2.5 Software Emulation of EMS memory

Due to the capabilities of the 386 and 486 processors, an Expanded memory manager like Quarterdeck's QEMM-386 can "convert" extended memory into EMS 4.0 memory. In the case of programs like QEMM-386, it is the Expanded memory manager that provides the mapping function through software control.

2.6 Multitasking more than 640K

Despite DOS normally being limited to 640K for its programs, DESQview can run more than 640K concurrently by using expanded memory. Programs are loaded first into the Application Area and when this is exhausted, DESQview will load programs into EMS 4.0 memory. As DESQview task switches from one application to another, it first maps the application from EMS memory into the Application Area and then runs it.

Note that EMS 3.2 memory is not used in this way due to the limitations of the specification; EMS 3.2 memory can only map a maximum of 64K and hence the available partition size is too small to contain the majority of programs.

On 8088/86 and 286 based systems, it is essential to disable motherboard memory to as low a value as possible (typically 256K) when using EMS 4.0 memory and DESQview. Due to hardware limitations of these processors, EMS 4.0 memory cannot be mapped on top of other memory (RAM or ROM) that is present in the system. If motherboard memory cannot be disabled, DESQview cannot multitask applications in EMS 4.0 memory. In the worst case, EMS 4.0 memory can act like EMS 3.2 memory to store "swapped" programs (see the "Program Swapping" section for details), but may still have the LOADHI capability outlined next.

2.7 LOADHI capability

Since DESQview uses the Application Area below 640K to perform its multitasking "magic", it can be seen that the larger this area is, the larger applications can be that run under DESQview (unless an application is a DOS Extended application - see the "DOS Extender" section for details).

Any TSRs (Terminate and Stay Resident programs) or drivers (such as mouse or network drivers) that are loaded before DESQview occupy space in conventional memory on top of DOS and reduce the amount of memory available to the Application Area. It is therefore advisable to keep the number of TSRs and device drivers using conventional memory to a minimum to ensure a maximum amount of space for applications.

One solution is available with the Quarterdeck QRAM, QEMM-50/60 and QEMM-386 products - the **LOADHI** capability. With this utility, TSRs and device drivers can be loaded into the unused regions of the System Area, thus freeing up more space below 640K and enabling larger applications to be run inside of DESQview.

2.8 Program Swapping

When all of the Application Area and EMS 4.0 memory has been used to store programs, any further loading of applications will cause DESQview to swap applications already running onto either a hard disk, a network drive, a RAM drive or expanded memory (even EMS 3.2 can support this type of operation). Any programs "swapped out" in this way will be suspended from running. Despite being suspended, any swapped applications can be swapped back in at the request of the user with only a

short delay. Doing this will force one of the currently running programs to be swapped out in order to make room if there is not enough memory for the incoming program.

Note: DESQview/X version 1.0 does not support DOS program swapping.

2.9 Switching and Windowing

Since DESQview can multitask multiple DOS applications, a user can **switch** from one application to another using two or three keystrokes or mouse clicks. Because of this, there is a concept in DESQview of one foreground application and multiple background applications.

Some applications may be running in **windows** smaller than the screen size and others may occupy the whole screen. In addition, some applications may be running in background, while others are suspended. These capabilities are dependent on the video behavior of the program and the machine's processor type.

2.10 Application Video Behavior

DOS applications may be written to produce display output in either of two ways. They may call DOS and BIOS routines to perform the output, or alternatively may write directly into the video area. The latter method is usually employed for speed reasons. Applications that use the DOS and BIOS routines are termed **well-behaved** and others that write directly to the video area are **ill-behaved.** Typically, graphical applications are ill-behaved; text-based applications may be either.

2.10.1 Well-Behaved Applications

Since DESQview can easily intercept DOS and BIOS calls, well-behaved applications may run in a small window or in background on any machine regardless of processor type. When a well-behaved application makes a video BIOS or DOS call, DESQview intercepts and executes the call, but places the relevant information in a special save area called the **logical window buffer** as well as clipping and shifting the information to appear within a small window on the screen.

2.10.2 Ill-Behaved Applications

Since ill-behaved applications write directly to the video RAM, DESQview cannot run them in a small window or in background unless the processor is a 386 or a 486 (see the "Virtualization" section for details). These applications, when run on an 8088/86 or 286 PC, can only run full screen in the foreground. Application developers should note that in many cases it is very easy to make an ill-behaved text application well-behaved, simply by adding a single subroutine call - see "The SHADOW Call" section for details.

2.10.3 Virtualization

Due to the sophisticated memory handling capabilities of the 386 and 486 processors, DESQview can redirect an application that writes directly to video RAM to a portion of memory that DESQview calls the **logical window buffer.** DESQview copies the information from this buffer to the actual video RAM, clipping and shifting it as necessary to appear within a small window. In this way, DESQview coupled with QEMM-386 and a 386 or 486 processor can **virtualize** ill-behaved applications (including graphics ones) in small windows and run them in background.

The only exception to this process are graphical DOS Extended applications - see the "DOS Extenders" section for more information. This is because the virtualization process uses a special processor mode that is incompatible with the DOS Extender.

Note: Version 1.0 of DESQview/X does not support the virtualization of DOS graphics programs.

2.10.4 Loaders

For machines that do not have a minimum of a 386 processor, a loader may be available to run an ill-behaved text program in a small window and in background. **Loaders** are utilities that alter a program's operation while it is running and coerce it into being well-behaved. Quarterdeck supplies several loaders with DESQview for use with programs such as Lotus 123.

2.11 Microsoft Windows

Microsoft Windows (and any Windows applications running within it) appears to DESQview simply as a graphical application and is handled as such. Consequently, Windows 3.0 real mode can be virtualized in a small window on machines with 386/486 processors whereas Windows 3.0 and 3.1 standard mode runs full screen (Windows standard mode acts like a DOS Extended graphical application).

Presently, Windows 3.0 and 3.1 386 enhanced mode does not function under DESQview. Note, however, that some of the extra capabilities of 386 enhanced mode (such as the virtualization of DOS windows) are duplicated in DESQview and are best handled by DESQview.

Note: DESQview/X includes special Windows drivers that enables Windows 3.0 in real mode and Windows 3.0, 3.1 in standard mode to run in small windows and remotely.

2.12 Application Types

There are three types of applications that exist in the DESQview multitasking environment: DESQview-oblivious, DESQview-aware and DESQview-specific.

DESQview-oblivious DESQview-oblivious programs are ones that know nothing about DESQview - this includes programs like Lotus 123, Microsoft Word or AutoCAD.

DESQview-aware A DESQview-aware program is one that has been modified slightly to make it run more efficiently in DESQview. Paradox, dBASE and WordPerfect are examples of DESQview-aware programs.

DESQview-specific A DESQview-specific program has been written to take advantage of the DESQview API (Application Program Interface). Consequently, these programs can only run when DESQview is present.

2.13 DESQview API

Present in every copy of DESQview is the **DESQview API** (Application Program Interface). This interface allows programs to call the DESQview subroutines and functions in order to start and close down other applications; move, resize and scroll their windows; perform intertask communication and many other functions. The DESQview API is callable by Assembler, C, BASIC, Pascal, Clipper and dBASE programs.

2.13.1 The SHADOW Call

One API call of particular significance is the **SHADOW** call. This call may be made whether DESQview is present or not.

An ill-behaved text application will typically determine the kind of system present (monochrome or color) and load a variable with the corresponding video RAM value for the system (either B000H or B800H). From then on, the application will use the variable in order to access video RAM.

If during initialization, a program performs the SHADOW call using the desired video RAM value before storing it, the program will then become well-behaved when running under DESQview. This is because DESQview returns the logical window buffer for that application, whereas under DOS, the SHADOW call returns the value unchanged.

Since the application stores the returned value and uses it whenever video RAM access is required, the application is writing directly into the DESQview logical window buffer instead of to the screen. DESQview **shadows** from the logical window buffer to the screen, clipping and shifting as necessary, so the otherwise ill-behaved text application can run in a small window and in background on all processor types. This process is fast enough to be rarely noticeable by the user. WordPerfect, Dbase and Paradox are examples of commercially available programs that do this.

2.14 Processor Types and Modes

Since the original PC was introduced in 1981, various processors have been used, each one superseding the previous version and providing greater functionality. This functionality was always gained with the advantage of backward compatibility with all the previous processors.

2.14.1 The 8088/8086 and Real Mode

When the PC was first introduced, it used an Intel 8088 microprocessor. This is a 16-bit architecture processor with a segmented memory scheme capable of addressing 1MB. The 8088 used an 8 bit external data path unlike its otherwise functionally equivalent bigger brother, the 8086 which used an external data path of 16 bits. The mode of operation of these two processors is termed **real mode.**

2.14.2 The 286 and Protected Mode

The 286 processor supplies a real mode capability, but improved upon the 8088/86 by providing a new mode called **protected mode.** In protected mode, the 286 can access up to 16MB of memory (again by using a segmented addressing scheme), however certain operations available in real mode (such as segment arithmetic) are prohibited in protected mode. In addition, protected mode also has the hardware necessary for an operating system to "protect" an application from crashing the system or overwriting another application.

Unfortunately, protected mode is sufficiently different from real mode that DOS and regular DOS applications cannot operate in protected mode. For a long time this limited applications to running in real mode and hence constrained them to the 1MB limit. Thankfully, a solution has become available that addresses this called the DOS Extender - see the "DOS Extenders" section for details.

2.14.3 The 386 and V8086 Mode

Next to be introduced was the 386. Providing backward compatibility means that the 386 has both a real mode and protected mode capability. But in addition to this, Intel added a third mode called **Virtual 8086 Mode** that can operate under the auspices of protected mode. This mode supplies a virtual 1MB 8086 style environment while running in protected mode. This elegant solution enables regular DOS and real mode applications to run under protected mode without modification. The 386 also has an effective addressing range of 4 Gigabytes. It supports a flat memory model as well as a segmented addressing mechanism.

Also included in the 386 were memory mapping capabilities, a 32-bit architecture and hooks for a paged virtual memory system as opposed to a somewhat meager segmented virtual memory system that became available in the 286.

Note that 386 technology has been realized in several processors including the 386SX, 386SL and 386DX. The 386SX processor uses the 386 32-bit architecture internally, yet has a 16-bit external data path. The 386SL chip is a low power version of the 386SX with built-in power management features and is primarily designed for battery-powered computers. The 386DX processor (basically a renamed version of the original 386) uses an internal 32-bit architecture and a 32-bit external data path.

All 386 processors are functionally equivalent and are referred by the 386 moniker for the rest of this document.

2.14.4 The 486

The latest member of the 80x86 family to be introduced was the 486 processor. Basically this is similar to a 386 processor with an internal memory cache and is faster due to improved instruction execution. The 486 appears in several variants including a basic 486SX, a low power 486SL and a 486DX version that sports an internal math coprocessor (an optional external component with the 486SX,SL and all the other previous processors). Another variant is the 486DX2 processor which appears to a computer system much like a regular 486DX chip, but executes instructions internally at twice the speed of a 486DX.

All 486 processors are functionally equivalent (save for math functions) and are referred by the 486 moniker for the rest of this document.

2.15 DOS Extenders

Since DOS cannot run in protected mode, a way was devised for protected mode applications to run under DOS and use other real mode services. Protected mode applications are desirable since they have access to up to 16MB of memory on a 286 and 4 Gigabytes on a 386/486.

A **DOS Extender** is a special utility that is linked in to a protected mode application. Whenever the application makes a DOS call or any other request that requires real mode, the DOS Extender copies down any necessary data into the 1MB conventional memory area and switches into real mode. It then calls the requested function and on return switches back into protected mode, returning any results to the protected mode application.

There are usually two types of DOS Extenders - 286 DOS Extenders and 386 DOS Extenders.

286 DOS Extenders These run 16-bit protected mode applications on a machine with a minimum of a 286 processor. They have access to a 16MB address space.

386 DOS Extenders These run 32-bit protected mode applications on a machine with a minimum of a 386 processor. They have access to a 4GB address space.

Note that some DOS Extenders combine the capabilities of the two different types and can handle both 16-bit (286) protected mode applications as well as 32-bit (386) protected mode applications.

Most DOS Extenders also have a **virtual memory** option. That is, a DOS Extended application may run in less memory than normally is required by using virtual memory techniques.

In essence, the DOS Extender becomes the system's **control program**. This normally would have posed a problem to DESQview as protected mode allows only one control program in a system. Since DESQview multitasks applications, multiple DOS Extended applications would conflict with each other as each expects to be the control program. This is compounded with the fact that DESQview 386 (DESQview plus QEMM-386) is also a control program.

To obviate this problem, Quarterdeck and Phar Lap (one of the companies that produce a DOS Extender) developed the VCPI (Virtual Control Program Interface) specification which has been adopted by all major 386 DOS Extender manufacturers - see the "VCPI Specification" section for details.

It should be noted that VCPI is a specification for 386 and 486 processors, yet 16-bit protected mode applications may be run on 286 machines. In order for DESQview to multitask multiple 16-bit protected mode programs on a 286 so that they do not assume control of the same blocks of extended memory, their individual 286 DOS Extenders must use the **XMS** (Extended Memory Specification) interface specification. A utility program called QEXT.SYS supplies the necessary XMS

services for 286 DOS Extenders running under DESQview on a 286 machine whereas QEMM-386 supplies the services for DESQview 386.

Note that a DOS Extended application consists of two parts. A real mode portion of the DOS Extender resides in conventional memory and interfaces with the protected mode portion that resides with the protected mode application in extended memory. When DESQview performs a task switch to a DOS Extended application, it ensures that the real mode portion of the application is mapped into the conventional memory Application Area and that the protected mode portion is "visible" in extended memory. Since the majority of the application resides in extended memory and only a small portion (the real mode part) need occupy the Application Area, DOS Extended applications tend not to be constrained by the size of the Application Area as regular real mode applications are.

Note: DESQview/X includes a built-in DOS Extender supporting 16- and 32-bit virtual memory and dynamic link libraries.

2.16 VCPI Specification

The VCPI specification was developed so that multiple protected mode control programs can coexist and interact within a single 386 (or 486) system. The specification consists of two parts - a VCPI server and several VCPI clients. The VCPI clients request memory and mode switching services from the VCPI server.

In a DESQview 386 system, the VCPI server is implemented within QEMM-386 and the DOS Extended applications become VCPI clients. Whenever a DOS Extended application requires memory services it calls upon the VCPI server to perform them. When QEMM-386 is not present, the DOS Extender performs all services for itself. The end result is that DESQview is able to run a mix of real mode and DOS Extended (protected mode) applications concurrently on a 386/486.

As mentioned earlier, 286 machines may run multiple 286 DOS Extended applications only if the DOS Extenders utilize XMS services.

2.17 DESQview Capabilities

DESQview's ability to window an application and run it in the background is a function of the machine's processor and the type of application. Here is a table that summarizes the possible combinations:

DESQview Capabilities		8088 8086	286	386 486
Well-behaved Text Application or Ill-behave Text Application with Loader	Real Mode	W	W	W
	16-bit Protected	-	W	W
	32-bit Protected	-	-	W
Ill-behaved Text Application	Real Mode	D	D	W
	16-bit Protected	-	D	WD
	32-bit Protected	-	-	WD
Graphics Application	Real Mode	D	D	W
	16-bit Protected	-	D	D
	32-bit Protected	-	-	D
Microsoft Windows 3.0, 3.1 and Windows Application	Real Mode*	D	D	W
	Standard Mode	-	D	D

W Application can run in a window and in background.
D Application can only run direct (full screen) and not in background.
WD Dependent on individual application - most run as W, some may run as D.
\- Processor cannot support this type of application.
* Available only with Microsoft Windows version 3.0.
Note: The above table presents the capabilities of the DESQview multitasker. For information on DESQview/X capabilities please see page QD-26.

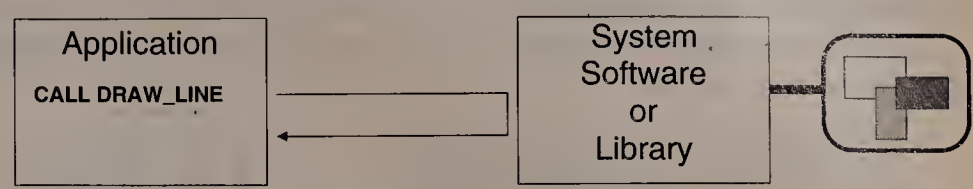
3 An Introduction to X

The basic concepts of the X Window System are described in this section. Readers familiar with X may elect to skip this section.

The X Window System is a powerful concept that utilizes machine and device independence as well as providing a graphical interface to users with both keyboard and mouse support.

3.1 Traditional Graphics Output

In traditional systems, if an application wishes to produce graphical output on a computer's display device, it will typically call a library or system software graphic subroutine. This subroutine performs the task requested (in the example shown, draw a line) and once the task has completed, control returns to the application.

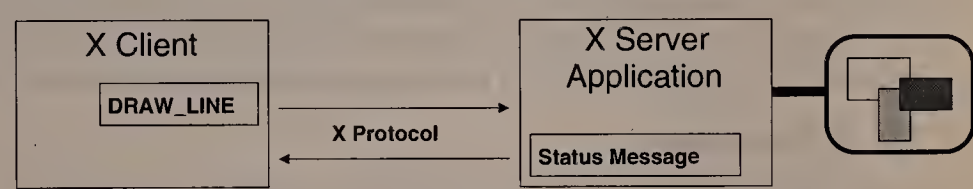


Traditional Graphics Output

3.2 X Servers, Clients and Protocol

In an X Window System, the system software is replaced by an application called the **X Server** - it is this application that has complete control of the display screen. An application that wishes to produce graphical output instructs the X Server to perform a specific task by sending it an information "message" that describes the task required. Sending a message to an X Server returns control immediately to the application and may or may not provoke a response from the Server.

The different types of messages are collectively called the **X Protocol**. One message draws a line, another a circle and yet another may print some text.



X Window Graphics Output

Any application that displays graphical output by sending X Protocol messages is labelled an **X Client** in contrast to an application that uses some other means.

In return the X Server may send back to an X Client special messages, such as event messages or error messages. These special messages are also part of the X Protocol.

X Clients typically create windows for their output. It is quite feasible (and generally the case) that a single X Client will create and utilize several windows on the X Server's screen simultaneously.

Note that an X Server may handle the graphics output for multiple X Clients concurrently and only understands X Protocol requests as a means to produce graphical output - it usually does not produce graphics output any other way.

3.3 An Event-Driven System

X is an **event-driven** system. That is, X Clients are typically suspended until an action occurs on the X Server for which they have a vested interest. X Clients are restarted by the X Server sending them special X Protocol messages. These event messages include ones that instruct an X Client to redraw its window (for example, if a part of its window becomes uncovered by the movement of another window), that a window's size has changed or that a key has been pressed. An X Client processes these messages, producing whatever output may be necessary and then returns to a suspended state until another message is received.

This is in direct contrast to the way traditional applications have been written. Those applications are **procedure-oriented** and are written to assume an active role in the interrelationship between the user and the program. Typically, the program will steer the user through the execution of the task at hand, forcing the user down a narrow set of predefined procedures. The program only accepts input (be it keystrokes or mouse clicks) from the user at predictable times. An order entry application is a good example of a procedure-oriented program.

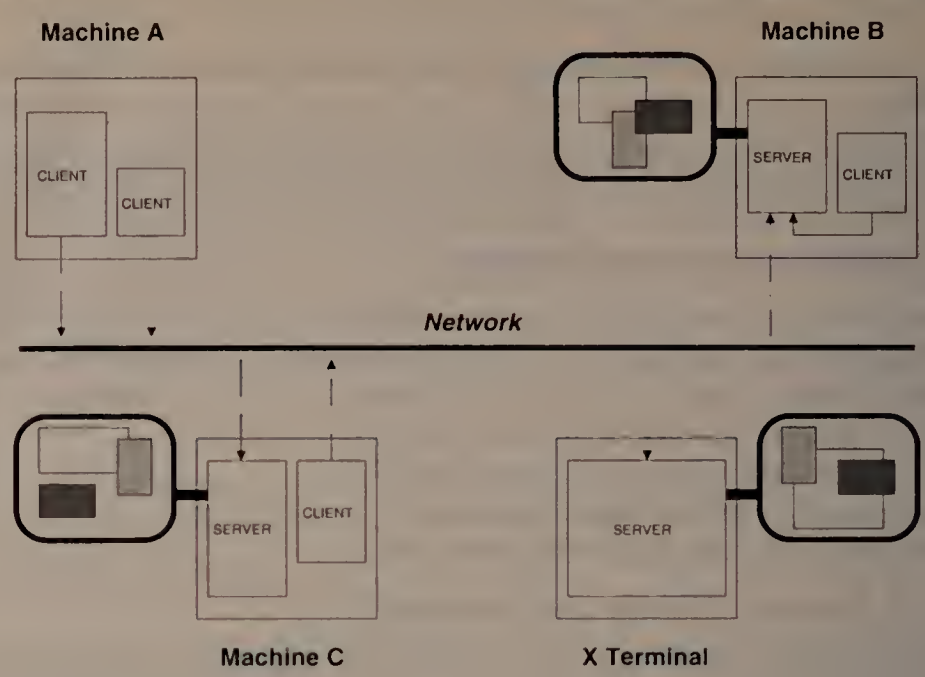
Event-driven applications take a more passive role in that they respond to input from the user or the system at unpredictable times. This type of application can provide a more flexible framework within which a user may operate. Typically there are no predefined procedures and many ways to complete a task - a user is free to use whatever tools the application provides and in any manner desired to achieve the final result. A drawing/designing type of program is a good example of an event-driven application.

3.4 A Distributed System

Since the X Client communicates with the X Server through information messages, it is possible for the X Protocol requests to be sent over a network to an X Server running on a different machine.

In fact the X Window System was designed around a system of messages specifically to be a networked graphical system.

In the diagram, an X Client executing on machine A is displayed on machine C's screen (using the X Server on C) and an X Client executing on machine C is being displayed on machine B's screen (using machine B's X Server).



3.5 Operating System and Architecture Independence

None of the machines need be from the same vendor or running the same operating system, since all communication between X Clients and Servers is performed over a network using a well-defined message protocol (the X Protocol). Naturally, a program cannot be copied to a different type of machine on the network and subsequently run - it would have to be recompiled for a different machine's architecture/operating system.

3.6 X Terminals

In the previous diagram, one of the clients running on machine A is being displayed by a special machine that only has an X Server running on it - in effect acting as a remote graphics terminal to machine A. This type of machine is called an **X Terminal** and its sole purpose is to display graphics from X Clients running on remote machines.

Typically, the majority of PC implementations of the X Window System have been as X Terminals. PCs are notorious for memory limitations and hence an X Server application would normally occupy all of the PC's memory. With the advent of DESQview/X, however, PCs can run X Servers, DOS applications, Microsoft Windows and X Clients simultaneously.

3.7 A Stand-Alone System

In the previous diagram, machine B's X Server was displaying output from an X Client running on machine C, but is also displaying graphics from an X Client running on itself. In this case, the X Protocol messages are not sent out over the network to another X Server, but are routed within the machine to the local X Server.

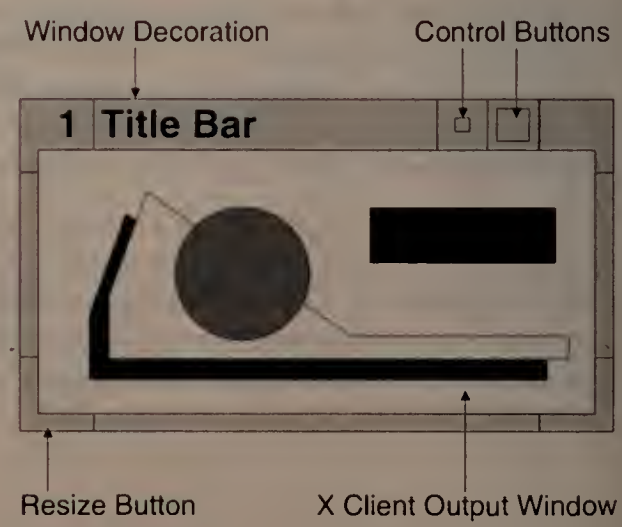
This concept can be extended to include a scenario whereby the machine is not connected to a network - all X Clients run locally and are displayed by the local X Server. Naturally, this requires a multitasking operating system - such as DOS with DESQview.

3.8 The Window Manager

The X Server only produces graphical output according to X Protocol requests and does not provide functions for the user to control the size, position and stacking order of the displayed windows.

These functions could have been implemented within each X Client, but would have lead to much redundant programming. They could have been implemented within the X Server itself, but the designers of the X Window System took a more flexible approach.

A special X Client is run (either locally or remotely) for each X Server, called the **window manager.** This program is given special privileges and is allowed to "supervise" all of the windows being displayed by the X Server. The window manager will typically place some form of window decoration around the outside of each X Client window that includes resize and move buttons as well as a title bar. It then becomes a function of the window manager to resize, move, rearrange a window according to the wishes of the user by mouse clicks on a window's decoration or selections from a window manager menu.



At present, there are several managers for the X Window System, the most prominent of which are the OSF/Motif, OPEN LOOK and the Tab (previously known as Tom's) Window Managers. DESQview/X also supplies its own window manager, DESQview Window Manager (DWM).

Due to the design of the X Window System, a window manager may be closed down and another may be subsequently started--without affecting any of the X Clients being displayed on the screen! The old window decorations disappear from the screen and are replaced by new decorations created by the incoming window manager.

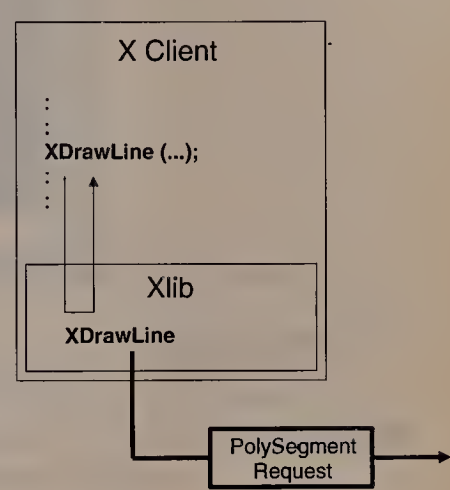
Note that the window manager only creates the "look and feel" of an X Client with regards to its window decoration. Whatever an X Client chooses to display in its output window is independent of the window manager. Program libraries are available to X Client developers that allow them to create an application with a specific look - either an OPEN LOOK or OSF/Motif look, for example. These program libraries are called toolkits and are explored in the next section.

3.9 X Development Layers

In order to create an X Client, a developer will call upon a variety of program libraries for assistance. For DESQview/X, these libraries can be linked into each X Client, or may be a shared resource among all X Clients on a system through the use of Dynamic Link Libraries (DLLs).

3.9.1 Xlib

For an X Client to be able to communicate with an X Server, it needs to generate X Protocol requests for transmission to the Server. Building these requests can be cumbersome and hence a library was created called **Xlib**. Xlib is (generally) the lowest level interface that an X Client uses to communicate with the X Server. It is a set of C subroutines that, for the most part, are a one-to-one mapping from C to X Protocol requests, though some Xlib functions can generate multiple X Protocol requests.



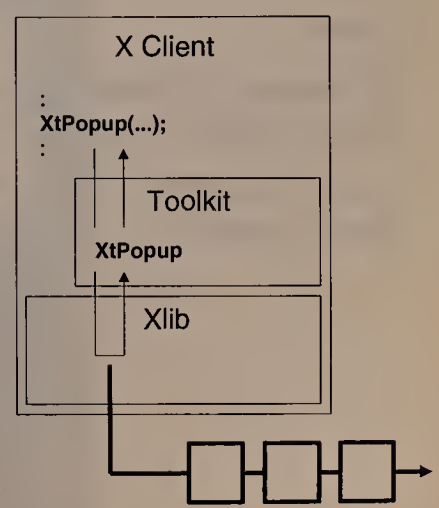
For example, if an X Client uses the function XDrawLine it calls the appropriate code inside Xlib which builds a PolySegment request and transmits it to the X Server.

Note that the Xlib library imparts no specific "look and feel" to an X Client - it merely consists of requests to create a window, draw a line, print some text, etc. The appearance of an application is generally determined by another program library - a toolkit.

X Clients may be written so that they use only Xlib and no other program libraries (toolkits).

3.9.2 Toolkits

Since Xlib is rudimentary in the scope of its capabilities, another program layer may exist on top of Xlib - the **toolkit**. Toolkits generally have routines for building menus, push buttons, slider controls and the like. Since the toolkit generates these basic window components for the X Client, it is the toolkit which creates the actual "look" of an application.



An individual toolkit function may call several Xlib functions, which in turn can create multiple X Protocol requests.

For example, if the X Client wishes to make a popup window appear, it could call (using one specific toolkit) XtPopup to perform the function. XtPopup in turn makes several Xlib calls which may generate multiple X Protocol requests.

An X Client may still (and often does) call Xlib functions even if it uses a toolkit.

Some of the more prominent toolkits that are generally available are as follows.

Athena Toolkit — A fairly rudimentary toolkit supplied by MIT (Massachusetts Institute of Technology).

OSF/Motif Toolkit — This toolkit is supplied by the Open Software Foundation and provides a sculptured 3D look. This toolkit (and its complimentary window manager) is promoted by a consortium of companies (OSF) that include DEC, Hewlett-Packard and IBM.

Olit Toolkit — A toolkit conforming to the OPEN LOOK* graphical user interface standard that is 3D in appearance. This toolkit and its OPEN LOOK window manager is promoted by Unix System Laboratories.

XView Toolkit — A toolkit conforming to the OPEN LOOK* graphical user interface standard, but with a different programming interface (SunView) than Olit. It is promoted by Sun Microsystems.

*Note that OPEN LOOK is not a toolkit or window manager in itself - it is merely a design specification for the appearance of a user interface. Olit and XView are toolkits that adhere to this specification and hence create the same look and feel.

The following screen shots should help to illustrate the concepts of a Window Manager, Toolkits and the like.

The X Clients in the previous picture are:

QOS Background An X Client written using only Xlib. A Toolkit is not necessary since it only creates a simple output window.

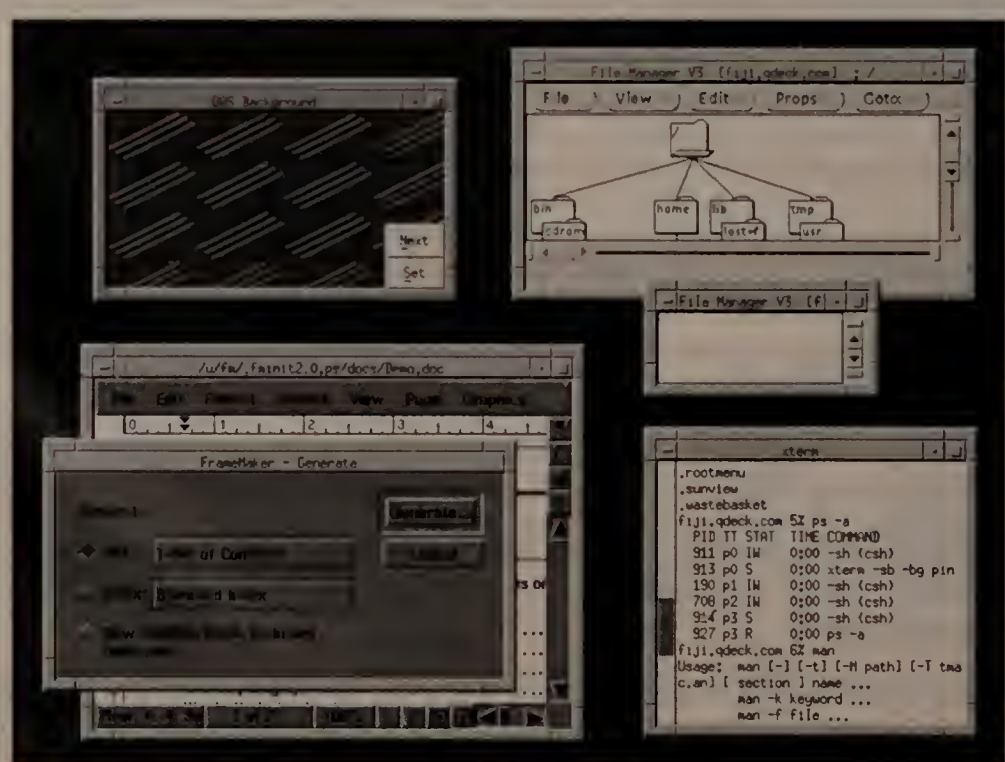
FrameMaker This electronic publishing package was written using the OSF/Motif Toolkit. The X Client is currently displaying two windows - an edit window and a "Generate" window.

Sun File Manager OPEN LOOK has characteristic buttons with rounded ends. This file manager, which uses an OPEN LOOK toolkit, has these rounded buttons. This X Client is currently displaying two windows - a directory tree and a wastebasket box.

Xterm This X client uses the Athena Toolkit to display a terminal session with a scrollbar on the left.

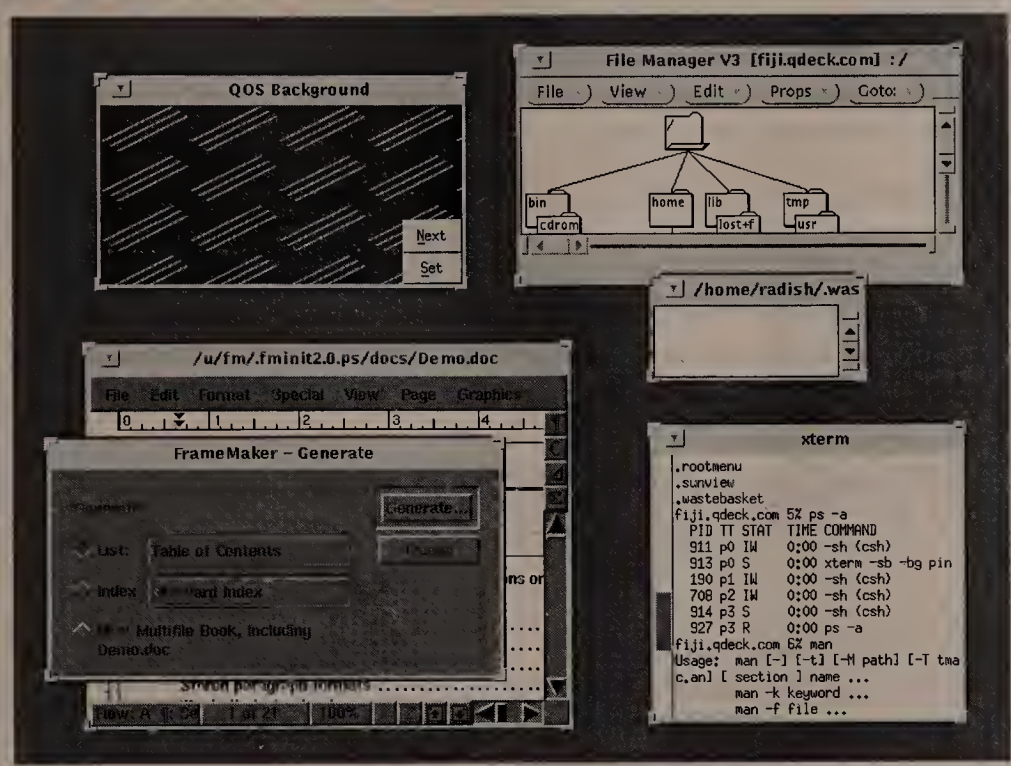
All of these X Clients are running under the control of the DESQview/X Window Manager. The window manager has placed a frame around many of the windows on the screen, along with decorations such as title bar and window number.

If the DESQview/X Window Manager is closed down and the OSF/Motif window manager is started, the following display appears:



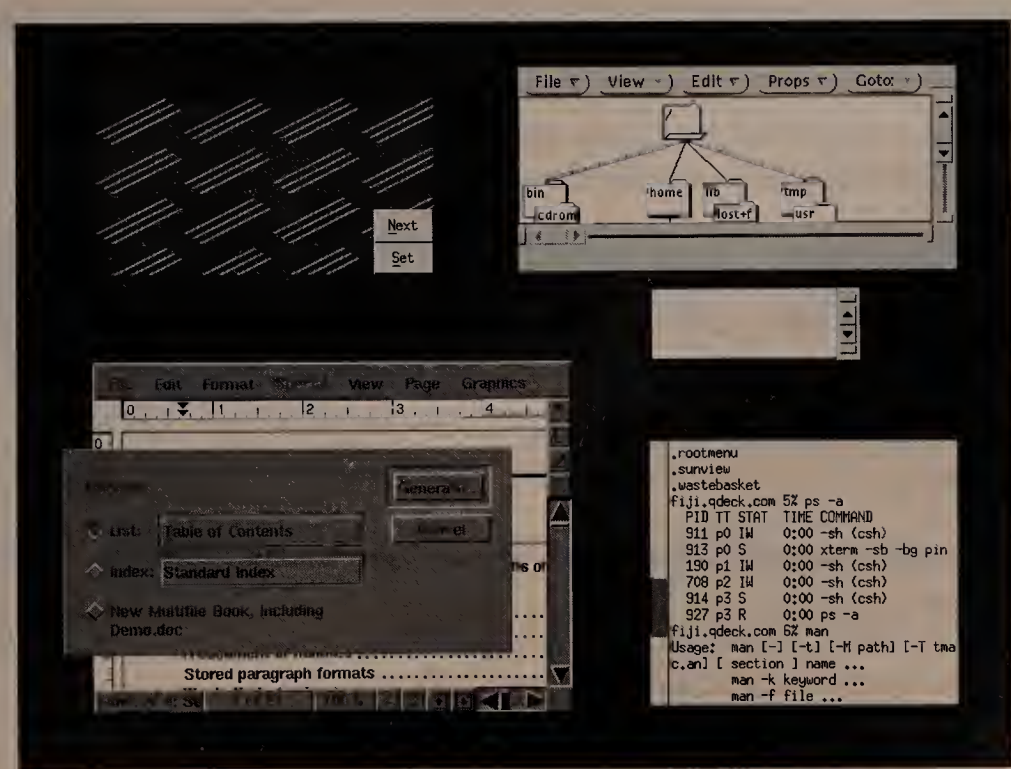
Despite a change in window managers, the X Clients' window contents remain the same. Only the window decoration has changed - in this case to an OSF/Motif 3D effect. Note that with the OSF/Motif window manager active, the X Client built using the OSF/Motif toolkit (FrameMaker) blends well into the environment, since it has the same appearance style as the window manager.

If the OSF/Motif window manager is now replaced by an OPEN LOOK window manager, the following display appears:



Once again a change in window managers does not change the contents of the X Clients' windows - only the window decoration has altered. In a similar fashion to FrameMaker and the OSF/Motif window manager, it can be seen that the Sun File Manager windows complement the OPEN LOOK window manager's window decoration. This is because both of these products were built using an OPEN LOOK toolkit and hence have an OPEN LOOK appearance.

Although it is unlikely that a user would want to run X Clients without a window manager, the following picture shows how this would appear:

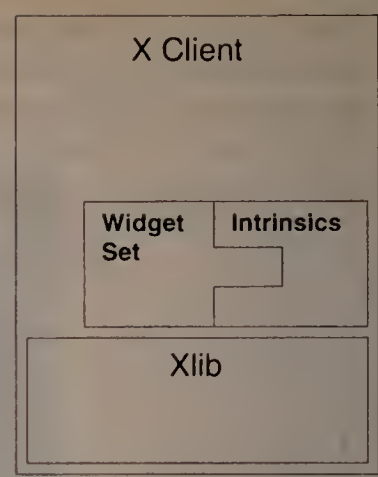


As can be seen in the previous picture, the usefulness of having no window manager is debatable, but not impossible. Having no window manager active would most probably occur when only one X Client is being run on an X Server.

These pictures highlight the concept of a window manager as being a special X Client that decorates the outside of all other X Clients' windows and allows a user to control their size, position and ordering on the screen. The pictures also show how a toolkit influences the look and feel of an X Client and how its appearance is independent of the active window manager.

3.9.3 Intrinsics and Widgets

Some toolkits may only be regarded as a single entity, but others are conceptually split into two parts. One of these parts is termed the Intrinsics and the other part, a Widget Set.



The Widget Set

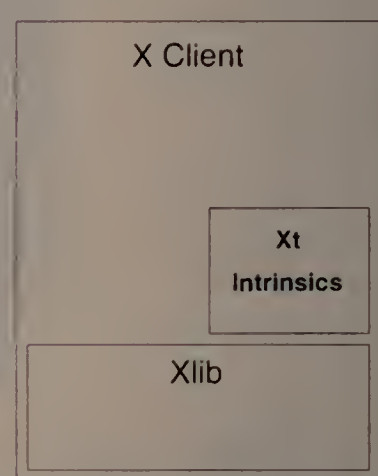
Widgets are abstract data objects such as buttons, scrollbars and other such objects. An X Client can be easily constructed from a number of widgets. The X Client does not have direct control of the actual appearance of a widget - only its general form, size or contents. The appearance is determined by the toolkit.

A **Widget Set** uses both function calls in the Intrinsics as well as Xlib.

The Intrinsics

The Intrinsics provide an object-oriented framework on which a Widget Set depends. It handles the creation, deletion and management of widgets as well as their event message handling. It is possible for an X Client to call the Intrinsics directly as well as the Widget Set (and of course, Xlib).

The Athena, OSF/Motif and Olit Toolkits consist of a Widget Set and the first Intrinsics to be developed for X - **Xt**.



3.9.4 Xt Intrinsics

In some cases, an X Client may only call the Xt Intrinsics and Xlib library. This type of application provides its own widget set, hence supporting its own unique set of abstract data objects (widgets) that are manipulated and managed by Xt.

An application that does this is able to provide its own look and feel, all the while saving its developer time and effort by using the object-oriented functions of Xt.

3.10 X11

MIT in association with a consortium of companies who have a vested interest in the X Window System (The X Consortium) releases MIT X distribution tapes containing the Xlib and Xt libraries as well as sample X Clients and an X Server. It is these tapes on which all other toolkits and X products are based.

The current revision of these distribution tapes is the X version 11 release 5 of the X Window System, otherwise known as X11 R5.

3.11 Toolkit Summary

Here follows a table of the Toolkits discussed in this document in summary form for quick reference:

Toolkit	Supplier or Promoter	API	Interface
Athena	MIT	Xt	(rudimentary)
OSF/Motif	OSF	Modified Xt	OSF/Motif
Xview	Sun Microsystems	SunView	OPEN LOOK
Olit	USL	Modified Xt	OPEN LOOK

4 DESQview/X

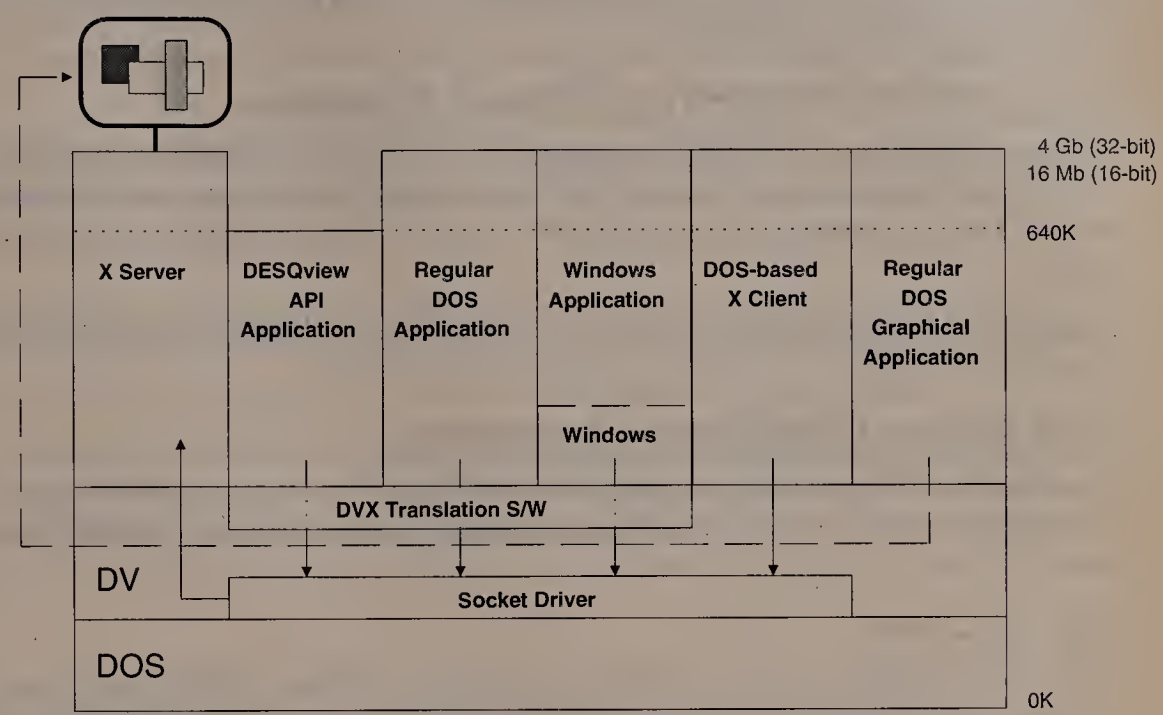
This section describes how the X Window System is integrated into the DESQview environment resulting in DESQview/X and highlights the capabilities of the combined system.

4.1 Minimum Requirements

DESQview/X currently requires a minimum of a 386SX processor, an EGA display, 4MB of RAM and 10MB of free hard disk space. In addition, a mouse is highly recommended.

4.2 General Structure

The general structure of a stand-alone DESQview/X system is shown to the right.



DESQview is loaded on top of DOS, the first program booted into the computer. Multitasking within DESQview can be several program partitions - one containing an X Server in the case of DESQview/X.

4.2.1 The X Server

Display output for the system is provided by the X Server program. The X Server is run within a DESQview partition and is multitasked along with all of the other programs in the system. The X Server in DESQview/X v1.0 is based on Release 4.0 of the X Window System.

The X Server controls the display screen (for the most part) and hence the display resolution of the system and compatible display types are determined by the X Server and not by DESQview. Currently EGA, VGA, Super VGA, 8514/A and DGIS displays are supported. XGA, TIGA and S3 displays are expected for the future - check with Quarterdeck Office Systems for an up-to-date list of displays supported.

The X Server is run as a DOS Extended application (up to 16MB) - this gives the X Server more workspace to perform its display functions and enables it to handle more windows concurrently. It is also available in virtual memory form so that it may use less memory than is normally required.

4.2.2 Socket Driver

Communication in most X Window Systems is accomplished using the Berkeley Socket interface. Consequently, DESQview/X includes the DESQview/X Socket Driver, which accepts these communication requests and intelligently routes the message to the appropriate destination. In the case of a standalone DESQview/X system, the messages are always routed between the X Server and the applications using the X Server for output. Note that the DESQview/X Socket Driver is loaded as part of the DESQview multitasking kernel.

4.2.3 Regular DOS Applications

If a regular real mode DOS application (for example WordPerfect or Lotus 123 release 2) is running within the system, its display output is translated dynamically (that is on-the-fly) by special DESQview/X Translation Software into X Protocol requests. These X Protocol requests are sent using the Berkeley Socket interface to the Socket Driver which routes them to the X Server for output. In effect, a DOS application is made to appear like a regular X Client.

DESQview/X does this for well-behaved applications by trapping their BIOS and DOS calls and converting them into X Protocol requests.

In the case of ill-behaved real mode applications DESQview/X **virtualizes** the application. DESQview/X remaps the application's video RAM to a different portion of memory and scans this **logical window buffer** for any changes, producing X Protocol requests from the scanning process. Note that this process requires a minimum of a 386 processor - the 286 processor lacks the necessary hardware to perform the remapping operation.

If a regular DOS application is DOS Extended (for example Lotus 123 release 3 or Paradox) and is running within the system, it is treated much the same as a regular real mode DOS application. The major difference being that DOS Extended applications have a far greater workspace available to them than do regular DOS applications (up to 16MB for a 16-bit protected mode application, 4GB for a 32-bit protected mode application).

4.2.4 DESQview API Applications

DESQview API Applications are, by their very nature, well-behaved DOS applications as they use the DESQview API to perform display output. However, the DESQview API allows these applications to create multiple windows as well perform display output to these windows.

This is handled in DESQview/X by intercepting all of the DESQview API calls and generating equivalent X Protocol requests, turning a DESQview API application into what would appear to be an X Client, just as with a regular well-behaved DOS application.

4.2.5 Microsoft Windows and Windows Applications

If Microsoft Windows 3.0 or 3.1 is running in a DESQview/X system along with one or more Windows applications, DESQview/X dynamically translates all Windows display output into X Protocol requests, much the same as it does with regular DOS applications. In effect, Microsoft Windows and Windows applications are made to appear like a regular X Client.

Because of this, a Microsoft Windows session can appear within a resizeable DESQview/X window alongside other X Client windows.

4.2.6 Regular DOS Graphical Applications

Translating a DOS application's graphics screen into X Protocol requests is possible, but is not implemented in DESQview/X Version 1.0. Currently, DESQview/X runs all regular DOS graphical applications as full screen applications only.

4.2.7 X Clients

X Clients may be running on a DESQview/X machine in one of three forms. If small enough to fit within the conventional memory Application Area, they may run in real mode. If larger, they require a DOS Extender to reside in the system. If the X Client is a 16-bit protected mode application, it may be as large as 16MB. If it is a 32-bit protected mode application, the X Client may (theoretically) be as large as 4GB.

Since X Clients already produce X Protocol requests (unlike DOS or Microsoft Windows applications), they need no translation software. Instead, their X Protocol requests are sent to the Socket Driver from the applicable Xlib routines using the Berkeley Socket interface (the standard method of communication in an X Window System). The Socket Driver then routes them directly to the X Server for display output.

Note that these X Clients may be ported from other X platforms (such as many Unix machines) or else may be developed directly under DESQview/X - see the "Development Issues" section for details.

It should be remembered that an X Client is similar to a DOS graphical application in that it produces graphical output, but is very different in the way it achieves this. DOS graphical applications usually write directly to video RAM; an X Client uses X Protocol requests to an X Server to produce the same effect. Thus an X Client can always be windowed.

4.3 Direct Windows

Note that regular DOS and Microsoft Windows applications can be configured to bypass the DESQview/X translation software and run as full screen direct windows (like regular DOS Graphical applications). Doing this eliminates the overhead of translating an application into X protocol requests, resulting in an increase of display speed, but at the expense of the application not being able to display on a remote machine.

4.4 Available Memory

In a typical DESQview/X system, real mode applications usually have at least 500K available to them regardless of their type - DESQview API, regular DOS or otherwise.

DOS Extended applications (which includes Microsoft Windows in standard mode), on the other hand, are usually constrained only by the total amount of memory in the system.

4.5 The Window Manager

Since a user will want to control the windows displayed on the screen by the X Server, a minimum of one X Client will normally be run in a DESQview/X system - the window manager. The window managers that are currently available include:

DWM The DESQview/X Window Manager provides a 3D sculpted look and has a menu system similar to DESQview. In addition, it boasts popular DESQview features such as Mark & Transfer and scripts. Best of all, DWM is under 100K in size!

OSF/Motif Using the OSF/Motif 3D sculpted look, this window manager is a DOS Extended X Client.

OPEN LOOK This window manager implements the OPEN LOOK graphical user interface and is a DOS extender X Client.

4.6 Fonts

The X Window System (through Release 4.0) has typically relied on bitmapped fonts to produce text output on an X Server. That is, a bitmap exists for a specific typeface (for example, Helvetica or Times Roman) realized at a specific point size. If an X Client requests a particular size of typeface and that size is not available (even though other point sizes in that typeface are available), the X Server would normally tell the X Client that the font does not exist and the X Client either terminates or uses a different font.

Drawbacks to this technique include the limited availability of a typeface to a few point sizes (typically 8 to 24) as well as excess use of hard disk space to store the different sizes that are supported.

4.6.1 Scalable Fonts

With the advent of laser printers, Adobe Systems, Inc introduced the PostScript printing language that took a different approach. Each typeface file was coded in such a way that the printer could scale an individual typeface to any size required. This new file format and the typefaces that were encoded in it are termed "Adobe Type 1 fonts".

The "intelligence" inside of the laser printers that produces the scaling function is actually a sophisticated computer program developed by Adobe Systems, Inc. This technology has been licensed by Quarterdeck Office Systems, Inc and has been incorporated transparently into the DESQview/X system. These font extensions, in no way prohibit continued support of Quarterdeck's scalable fonts when DESQview/X supports the X Window System Release 5.0 (which does define the use of scalable fonts).

When an X Client requests a typeface at a particular size, the DESQview/X X Server first checks its list of available fonts - this font list contains both bitmap and Adobe Type 1 fonts. If it cannot find either a bitmap font of the correct size or a scalable font that can be scaled appropriately, the X Server will return an error. If, however, a font was found, the X Server checks to see if it is presently loaded into memory (for another X Client). If necessary, the X Server will load the font and (in the case of Adobe Type 1 fonts) scale it to the requested size.

4.6.2 Using Scalable Fonts

Advantages of the scalable font technology include an almost endless choice of point sizes for a particular typeface as well as the subsequent economies of hard disk space. In addition, the Adobe Type 1 font format has proved to be the most popular and prolific file type resulting in a vast choice of Type 1 typefaces currently available.

Since the interface for using a scalable font is identical to that for requesting a bitmapped font, an X Client which has no knowledge of scalable fonts may, in fact, be given a scalable font realized at a particular point size if the requested bitmapped one is not present!

On the other hand, an X Client that has been written to recognize scalable fonts can use them to its advantage by creating fully scalable windows, wherein if a user resizes a window, the contents of the window (including the text) scales accordingly. In addition, this kind of X Client can also make use of the fractional spacing and kerning information that is stored in the scalable font file. One example of an X Client that uses scalable windows is the Adobe Type Manager that is supplied with DESQview/X which allows a user to install or delete Adobe Type 1 fonts from a DESQview/X system.

4.6.3 Scalable DOS Windows

Scalable fonts have also been used to great advantage in DESQview/X when displaying DOS text windows (regular DOS applications). When instructed to do so, DESQview/X will scale a DOS window to whatever size the user resizes the window - from a window that occupies the full screen all the way down to a size where each character in the window is represented by only a single pixel!

The benefits of this technology become clear within minutes of using it - a user can view many more DOS windows simultaneously than was previously possible and can shrink a window down to its minimum size in order to keep an eye on the DOS application's progress in background (for example, when performing a long file transfer with a communications program).

4.7 Advanced Memory Management

Incorporated into DESQview/X is the DOS/4GX Extender technology from Rational Systems, Inc that provides many useful benefits in the area of memory management.

With this technology, it is possible for DESQview/X to run all three types of application for the PC (real mode, 16-bit protected and 32-bit protected) directly. This produces a substantial saving in memory overhead for protected mode applications.

In addition, the DOS/4GX technology also provides both virtual memory and dynamic link library (DLL) capabilities to protected mode applications.

Note, however, that only applications generated specifically for the DOS/4GX Extender can call upon the DOS/4GX technology in DESQview/X. This does not, however, preclude applications developed using other DOS Extenders from running in a DESQview/X system - they will simply not be as memory conscious as a DOS/4GX application since a separate copy of the DOS Extender will be loaded for each instance of the program. In addition, they will not be able to take advantage of virtual memory or dynamic link libraries unless their individual DOS Extender supports these features.

4.7.1 Virtual Memory

Virtual Memory is a technique used in advanced computer systems, wherein an application is divided up into discrete chunks - usually these chunks are regular in size and are called "pages" (otherwise if the chunks are irregular in size, they are called "segments", though for the rest of this section the former term will be used).

When an application is actively running, it typically only uses a few pages of the program in a given time frame - these active chunks are referred to by computer scientists as the "working set" of pages. Since only a few pages are being used at any one time, a large program can waste a lot of memory in a system with inactive pages that may never even be used.

To maximize the use of memory, a computer can load only the working set of pages into memory and run the application as normal. If the application requires a page that is not currently in memory (for example, when "jumping" to a different part of the program, crossing over from one page to the next or accessing a piece of data), a "page fault" is generated by the computer hardware. At this point, the computer chooses a page not being used, swaps it out to hard disk, reads in the required page and then continues executing the application. This process is totally invisible to the application and requires no special programming by the application's developer, hence the term "virtual memory" since the memory always appears to be present to the developer, though physically it may not be all the time.

It is important, however, that sufficient memory is available to hold an application's working set - too little memory will cause page faults to happen with greater frequency so that the computer will spend most of its time accessing the hard disk.

With its DOS/4GX technology, DESQview/X provides this virtual memory option so that more applications can be run concurrently than the amount of memory would normally dictate.

4.7.2 Dynamic Link Libraries

Most applications call on a standard set of routines which need to be duplicated in every application that uses them. Typically these routines are stored in a library of routines and are "linked" in when an application is being generated (at compile time). A good example of this would be the Xlib programming library that is required by X Clients.

Naturally, this leads to a waste of both computer memory and hard disk space as the same information appears in separate applications.

Dynamic Link Libraries (or DLLs) are a way of sharing these routines among several applications. The routines are stored on disk in only one place - the dynamic link library - saving space on a computer's hard disk. Whenever an application is loaded that requires a specific DLL, the computer first checks to see if that DLL has already been loaded for another application. If it has been loaded, the computer points the application to the DLL already in memory. If it is not loaded, the computer will load the DLL first before it can be used by the application. Since multiple applications use the same copy of the DLL while running, memory space is conserved. Note that when all applications using a DLL terminate, the DLL is discarded from memory as it is no longer needed.

Along with the advantages of saving disk and memory space, DLLs also provide another benefit known as "late-binding". Early-binding occurs when routines are linked into an application at compile/link time on the application developer's machine - the application becomes a single entity that cannot be changed unless the developer issues an update. DLLs, by their very nature, exhibit late-binding - the linking process occurs at run time, on the user's machine, after the application was compiled.

This difference seems trivial until a scenario is considered whereby several different applications from different manufacturers (or even the same manufacturer) use the same DLL. Assume the DLL provides access to a particular type of device, a tape drive for example, and that the drive manufacturer releases a new drive with a slightly different hardware

interface. Without DLLs, all applications that used the previous tape drive would have to be recompiled by their respective companies and updates sent to existing customers that purchase the new drive. With DLLs, only a new DLL need be produced and distributed to customers along with the new drive. The more applications that use a particular DLL, the bigger the advantage of late-binding. Note that DLLs are not updated solely because of new features, but can also be updated because of enhancements to a DLL's routines.

With its DOS/4GX technology, DESQview/X can conserve both disk and memory space as well as delivering the advantages of late-binding through the availability of a dynamic link library option.

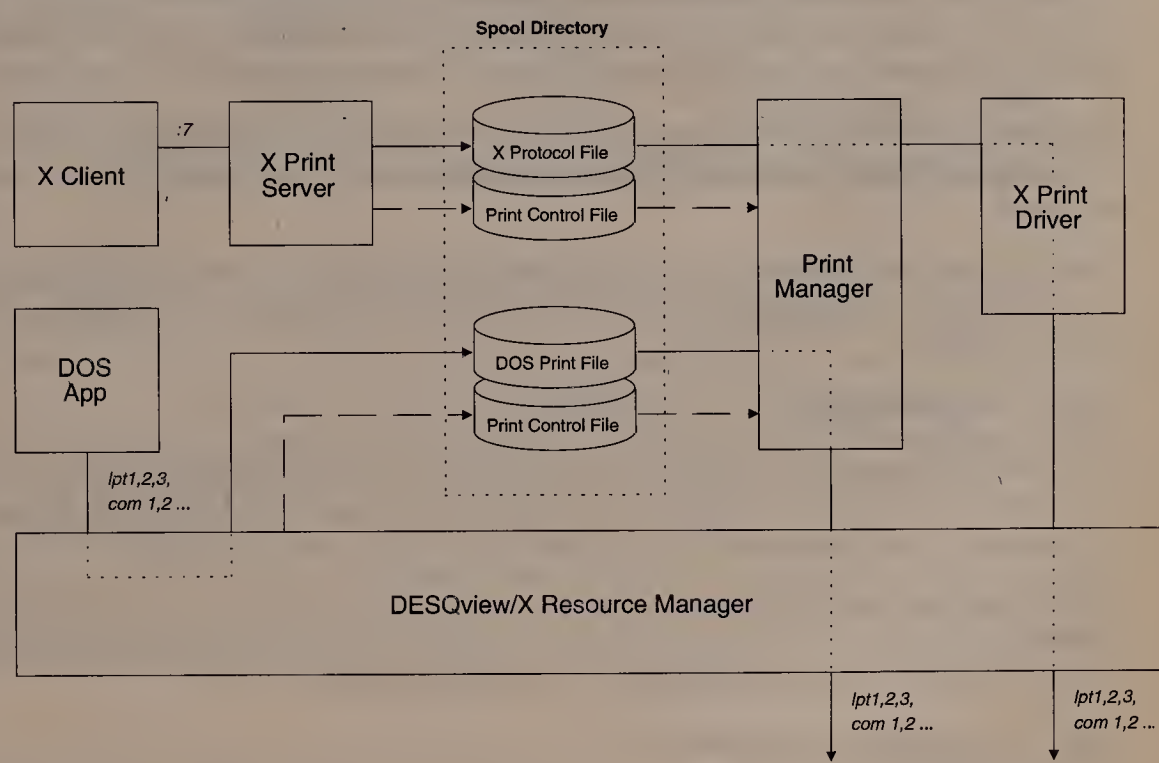
4.8 Print Server

The DESQview/X Print Server consists of several components - a Print Manager, an X Print Server and an X Print Driver. In addition, the Print Server calls upon the services of the DESQview/X Resource Manager when printing from DOS applications.

For DOS applications, DESQview/X may be configured such that it will manage contention for the same printer and can spool the print information to disk until a printer is ready to receive it. (Note that DESQview/X can also be configured such that no spooling or contention management is performed and printer output is routed directly to a printer.)

For X Clients, DESQview/X always spools X Protocol requests to disk and translates these requests into the appropriate printer commands thus providing a single output imaging model.

The components of the DESQview/X Print Server and the interrelationships between those components are shown to the right.



Despite there being the interaction of several components in order to print a file under DESQview/X, the user normally only sees and interacts with the Print Manager (which provides choices such as holding, resuming and killing print jobs). The X Print Driver is a "daemon" (unseen) process that is both created and killed by the Print Manager, the X Print Server is implemented inside of the X Server process and the DESQview/X Resource Manager is a special driver loaded by the DESQview multitasker.

4.8.1 DOS Application Printing

When a DOS application prints to a printer, it does so through either the printer ports LPT1, LPT2, LPT3, the communication ports COM1, COM2, or the DOS file handle 4. When running in DESQview/X, the DESQview/X Resource Manager traps these requests and spools the print information into a DOS print file as well as creating a print control file that specifies additional information (such as which printer to print the file on and the number of copies). These two files are created in the DESQview/X spool directory. The Resource Manager then informs the Print Manager of the file that needs printing, whereupon the Print Manager adds the request to the end of its print list.

When the Print Manager is ready to print a particular file, it reads the information from the relevant printer control file and routes the DOS print information from the file to the correct printer. The Resource Manager recognizes that it is the Print Manager trying to print and allows the printer information to pass through (via the printer ports LPTx, communication ports COMx or DOS file handle 4) instead of trapping the print operation.

Note that DESQview/X does not alter the DOS print information in any way. Therefore, all DOS applications must be configured correctly for the printer type attached to a DESQview/X system (PostScript, IBM Proprinter or otherwise).

4.8.2 X Client Printing

Unfortunately, the X Window System does not define a standard for X Clients to produce printer output, with each system manufacturer taking their own approach. It was decided for DESQview/X that printing from an X Client should be performed using exactly the same method as for displaying output on the screen, that is, by using the X Protocol.

This single imaging model has the distinct advantage of simplifying the coding of X Clients as they need only support one type of output device - regardless of whether the output is destined for the screen or printer. In addition, this also makes existing X Clients easier to update to include printing capabilities.

Under the X Window System, an X Client specifies on which X Server it wishes to display output by means of an address that takes the form machine_name:display_number.screen_number (note that in X, the term "display" refers to a workstation that consists of a keyboard, a pointing device and one or more screens). Hence the address radish:2.1 refers to the second screen (0 is the first and 1 is the second) on the third workstation (0,1 then 2) on the machine called "radish" on the network.

If an X Client connects to a DESQview/X workstation using the display number 7, for example radish:7, (note that if a screen number is not specified it is presumed to be 0), the X Print Server in the DESQview/X X Server recognizes this and spools the X Client's X Protocol requests into a file in the DESQview/X spool directory. In addition it also creates a print control file that specifies additional information for the Print Manager.

When the X Client disconnects from display number 7, the X Print Server informs the Print Manager of the file that needs printing, whereupon the Print Manager adds the request to the end of its print list.

When the Print Manager is ready to print a particular file, it reads the information from the relevant printer control file and, recognizing that the file is an X Protocol file, passes the file over to the X Print Driver for processing. Note that the X Print Driver is under the control of the Print Manger which both starts and removes the X Print Driver from the system as necessary. When the X Print Driver is handed an X Protocol File, it translates the X Protocol requests into the necessary printer codes and outputs them to the X Printer connected to the DESQview/X system.

The Resource Manager recognizes that it is the X Print Driver trying to print and allows the printer information to pass through (via the printer ports LPTx, communication ports COMx or DOS file handle 4) instead of trapping the print operation.

Note that only one printer may be designated as the X Printer (though, DOS applications may also output to this printer if they are configured to recognize the printer type) - the selection of the X Printer is performed using the DESQview/X Setup program.

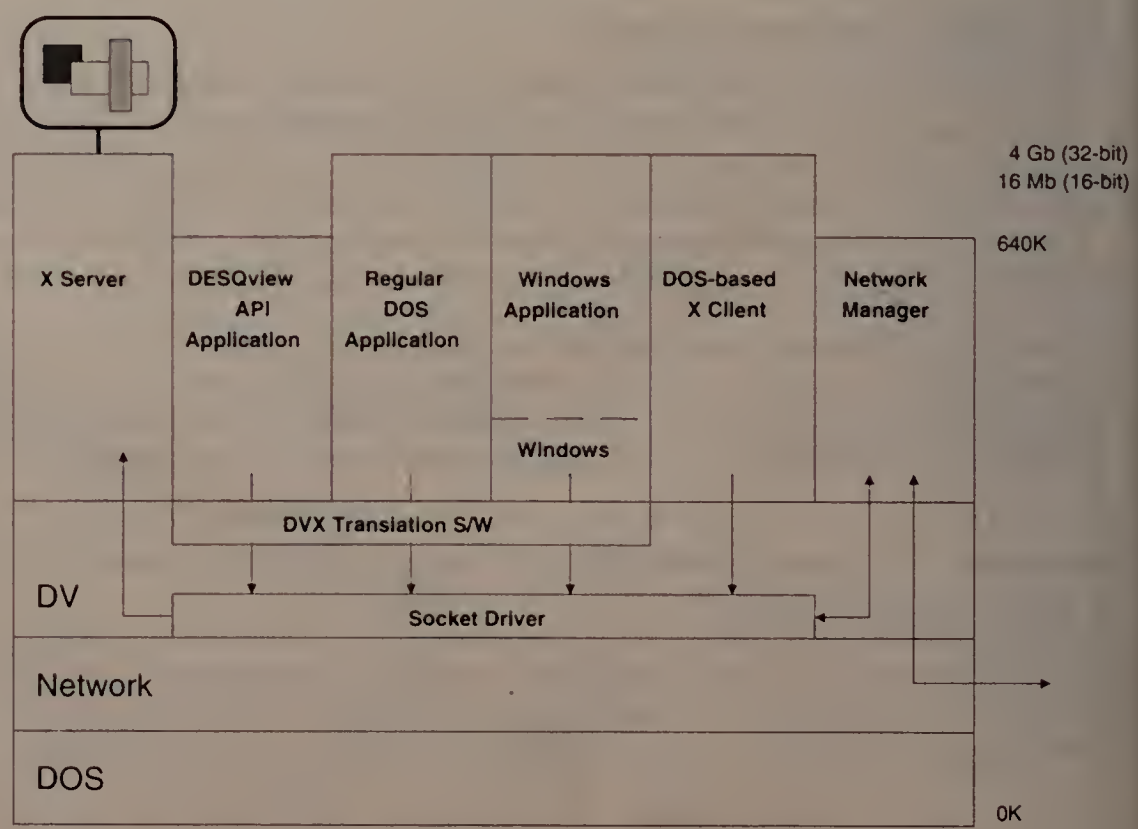
4.8.3 Print Manager

The Print Manager can be thought of as a traffic officer, directing files to the appropriate printers at specific times or alternatively to the X Print Driver. It is possible for the user to interact with the the Print Manager, list and reorder files in its print queue, suspend and resume printing as well as other operations.

Note, however, that DESQview/X may be configured such that spooling can still occur even if the Print Manager is not present in the system. When the user then starts up the Print Manager, it searches the spool directory for printer control files, produces a resulting print queue and begins printing.

4.9 The Network Connection

When a DESQview/X system is connected to a network, the structure is identical to that of a stand-alone system, but with the inclusion of network software and the DESQview/X Network Manager.



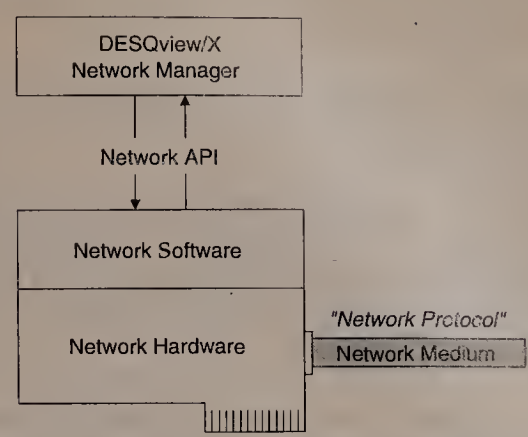
4.9.1 The Network Manager

The DESQview/X Network Manager is the bridge between the DESQview/X Socket Driver and the underlying network software. Since PC networks and their supporting network software vary greatly, a different version of the Network Manager is supplied depending on the type of network installed. Currently, the DESQview/X Network Manager can communicate using the following network APIs and network software: NetBIOS, Novell Netware IPX/SPX, FTP

Systems PC/TCP, and Novell's LAN WorkPlace for DOS. Check with Quarterdeck Office Systems for an up-to-date list of network APIs/software supported.

Note that there are many pieces in the network puzzle that must be compatible with each other in order for DESQview/X (or any other piece of software) to function over a network.

The DESQview/X Network Manager communicates with the Network Software using a network API. The network software in turn communicates with a piece of network hardware (using the hardware's specific interface) which then sends the network data out over a network medium (usually a cable of some sort) according to a network protocol (a particular format for the data). The examples at right should make this relationship clear.



Because of the tremendous variety available between network software and hardware, Quarterdeck Office Systems cannot publish an exhaustive list of networks supported. Quarterdeck has an ongoing program to support popular network API's/software and will be making them available as soon as they are developed.

API	Software	Hardware	Medium	Protocol
IPX/SPX	Netware (Novell)	NE-2000 Adapter	Ethernet Cable	IPX/SPX
NetBIOS	IBM Token Ring Network (IBM)	IBM Token Ring Adapter/A	Token Ring Cable	NetBIOS
private	PC/TCP (FTP Systems)	NE-1000 Adapter	Ethernet Cable	TCP/IP

Examples of Network Software and Hardware Combinations

4.9.2 Operation over a Network

When an X Client (DOS-based X Client, DOS or Microsoft Windows application translated to X Protocol requests) is started under DESQview/X, a parameter is supplied that specifies which screen the program's output should be displayed on. (This is standard procedure for any X Window System.) If the display specified is not the local DESQview/X screen, the DESQview/X Socket Driver will route the X Protocol requests to the DESQview/X Network Manager. The Network Manager then uses the appropriate network API to transmit the request to the correct machine on the network via the network software. If, on the other hand, the output should appear on the local screen, the Socket Driver will route the X Protocol requests directly to the local X Server as in the case of the stand-alone system.

Conversely, if another machine on the network sends X Protocol requests to the DESQview/X system for display on its screen, the request is first accepted by the Network Manager. The Network Manager will then route the requests to the local X Server via the Socket Driver by using the Berkeley Socket interface.

4.9.3 Communication Ports

Most networks rely on the notion of "ports" when communicating. An application will connect to a port on a remote machine in order to communicate with it. In machines that run the X Window System, TCP/IP or the Unix operating system, several of these ports are "reserved" and imply a special type of connection.

For example, port numbers starting at 6000 are the X Protocol ports (remember that a machine can have multiple X Servers connected to it so that 6000 refers to the first X Server (or "display number" 0), 6001 to the second, etc). Whenever an application connects to port (for example) 6002 on a remote machine and sends a message to it, the receiving machine knows that it is an X Protocol request by virtue of the port number. It is then the receiving machine's duty to dispatch the request to the appropriate X Server (the third X Server, or display number 2, in this case).

Note that there can be multiple connections to a single port. This is because a connection is defined by both the sending machine/port number and the receiving machine/port number. Since most reserved ports do not take into account the number of the sending port, one machine can have multiple connections to another machine's port by choosing different send ports. This is necessary when (for example) multiple applications on one machine connect to the X Server on another.

Other reserved ports imply several other functions - RSH (Remote Shell), REXEC (Remote Exec), FTP (File Transfer Protocol) and Telnet. Unlike the X Protocol port, these 4 other ports typically spawn "daemons" - programs that are invisible to users of the remote machine and execute in the background. DESQview/X supplies daemons for RSH, REXEC and FTP, but not Telnet - see the Telnet section for deatils.

4.9.4 Remote Shell

A **remote shell** (RSH) is one method for starting up applications on remote (other) machines anywhere on the network. When a user types in an RSH command on one machine, the RSH program connects to the RSH port on the remote machine. At this point, the remote machine (recognizing that the RSH port was connected to), spawns an RSH daemon.

This RSH daemon takes the command supplied in the RSH message and executes it on the remote machine for the user specified in the message, sending any output back to the originating port - typically this output is simply echoed to the screen by the originator's RSH program.

DESQview/X supplies both an RSH daemon to respond to RSH requests as well as an RSH program that can send RSH requests to another machine.

This is a very powerful concept - remember that X Protocol requests produced by an X Client may be routed to any X Server on the network. A user seated at one machine (be it DESQview/X or Unix) may use the remote shell feature to start up an application on another machine, yet have its output appear on the user's local machine (or any other display on the network). The user is now able to operate and use the X Client that is running remotely. X Clients that are run this way are termed remote clients.

Naturally, there are safeguards in the RSH feature that are intended to stop unauthorized access to remote machines, however, they are far from complete. Because of this, the Remote Exec feature was developed.

4.9.5 Remote Exec

The **remote exec** (REXEC) function is very similar to the RSH command except for how it guards against unauthorized access. With REXEC, the user supplies a password that is transmitted along with the REXEC command. If the password is not valid for the user name specified in the message, the command will fail.

DESQview/X supplies both an REXEC daemon to respond to REXEC requests as well as an REXEC program that can send REXEC requests to another machine.

4.9.6 File Transfer Protocol

The **file transfer protocol** (FTP) function is used to transfer files to and from a remote machine, as well as list directories on the remote machine.

The FTP daemon responds to a limited set of english-like commands that specify actions such as listing a directory, changing to another directory and receiving or transmitting a file. The DESQview/X File Manager application uses these capabilities to perform sophisticated file operations between machines. It connects to the remote machine's FTP port and issues the low-level FTP commands to gather information required and transfer files.

DESQview/X supplies an FTP daemon to respond to FTP requests and the DESQview/X Network Manager - DESQview/X to Other X Systems includes an FTP program that can send basic FTP requests to another machine. The FTP program is not included in the base product as the File Manager companion is easier to use and more advanced.

4.9.7 Telnet

The **Telnet** function is used to create a terminal session on a remote machine which is displayed on the local machine. A Telnet request invokes the Telnet daemon, which in turn (typically) starts a "shell" program, such as the login program on most Unix machines. The session then behaves much like a modem communications session - the shell program on the remote machine (and any programs run under the shell) send characters and terminal control sequences which are routed via the Telnet daemon to the Telnet requestor and then to the user's display. In turn, the Telnet requestor will also send characters typed by the user to the Telnet daemon which routes them to the shell program.

Since Telnet was primarily designed for communicating with a TTY-style (line and character-oriented) device, the Telnet daemon has not been implemented for DESQview/X as this would require a program capable of translating DOS screens into TTY-style commands. Instead, a remote machine running the X Window System can use RSH or REXEC to start a DOS session. Note, however, DESQview/X does supply a Telnet client that can start a Telnet session on a remote (non-DESQview/X) machine.

4.9.8 Remote Clients

The remote shell and remote exec functions open up a wealth of possibilities for users connected over a network by spawning **remote clients**. All of the X Clients on an X network can be started up and used by any X Window user on the system.

Since regular DOS and Microsoft Windows application screens can be dynamically converted to X Protocol requests by DESQview/X, DOS and Windows applications appear on a network as X Clients. Because of this, non-DOS users on a network may use DOS and Windows applications available on a DESQview/X machine. Applications that may not be used this way are those which cannot be translated into X Protocol requests on the host DESQview/X system. Currently, those applications are regular DOS graphical applications.

In effect, any DESQview/X machines on a network appear somewhat as Unix machines with their DOS and Microsoft Windows applications running as X Clients.

The converse to the above is also applicable - a networked DESQview/X machine may use X Clients available on other non-DOS machines (for example, a Sun or SCO Unix system.)

4.9.9 Interprocess Communications

Communications between processes is implemented in DESQview/X through the industry standard Berkeley Socket interface - the primary means of IPC communications for Unix machines.

This interface was designed to be totally independent of any underlying network and hence can be used by one process to communicate with another on a different machine across a network, regardless of the type of network (TCP/IP or Novell, for example). In DESQview/X, Berkeley Socket interface calls are accepted by the DESQview/X Socket Driver which routes them to the appropriate destination - whether to another application in the same machine, or to an application on a remote machine by broadcasting the message over a network. This results in the simplified coding of an application as it communicates with both local and remote applications in exactly the same way.

In a similar fashion to the DESQview API mailbox interface, the Berkeley Socket interface does not dictate the content of the message sent to another process, hence any manner of dialog may be implemented between two processes.

4.10 Stand-Alone or Networked?

DESQview/X may be run either as a stand-alone system or networked.

If run as a stand-alone system, applications typically run on the system will be the X Server (for display output), a window manager (to control the windows), multiple DOS and Windows applications and multiple X Clients.

If a DESQview/X machine is networked, the minimum required running is the X Server and Network Manager. The window manager and any X Clients (be they regular X Clients or dynamically translated DOS or Windows applications running on another DESQview/X machine) may all be run remotely on other machines on the network. Usually, some local applications will also be run.

4.10.1 Unix Machines and DOS/Microsoft Windows programs

Assume a network to primarily consist of Unix machines and/or X terminals. If a DESQview/X machine is added to the network that has a powerful processor (such as a 386 or 486), all of the Unix X Window users would then be able to use many of the DOS and Microsoft Windows applications that are available on the DOS (DESQview/X) machine.

4.10.2 DOS Machines and Unix Programs

The converse to the above situation is also true. On a DOS-based (DESQview/X) network, the addition of a Unix machine provides the DOS users access to any X Clients on the Unix machine. Large, powerful applications now become feasible that are not available for DOS and which would suffer running under a slower processor. In addition, by using the Xterm application on a Unix machine enables DOS users to access that machine's character-based non-X applications as well.

4.11 A User's View

It is not important to the user whether an application being used is running locally or remotely. It is possible with DESQview/X to hide all of these details, such that a user views a screen much like the one shown.

The screen shot shows a DESQview/X system with the DESQview/X Window Manager. Some applications are labelled "remote" or "local" for illustration purposes only, though a user's implementation of this system may elect not to show this kind of information.

In the picture, DOS 128K (COMMAND.COM) and Borland C++ are DOS applications, one running on a remote DESQview/X machine, the other locally; Lotus 123 is also a local DOS application, but is displayed in a scalable DOS window. Application Manager (labelled "Toolbox"), its Help window and Clock are DOS-based X Clients; Xterm is a remote X Client running on a Sun workstation; and MS Windows is a Microsoft Windows session that is being run on another DESQview/X system, but displayed locally.

4.12 A Consistent Growth Path

DESQview/X is built on the existing technology of DESQview and DESQview 386 - two time-proven DOS multitaskers that are popular worldwide. Because of this, Quarterdeck can provide users with an excellent and consistent growth path that starts with DESQview:

DESQview — DESQview provides the DOS user with a multitasking environment on machines with as little as 640K, a hard disk, a monochrome monitor and an 8088 processor. DESQview is a character-based environment, but can also run graphics applications. Features include windowing and program swapping as well a keyboard macro program, a help system, a DOS Services utility and easy-to-use keyboard or mouse control.

DESQview 386 — In addition to DESQview's features, DESQview 386 provides the 386/486 DOS user with a multitasking environment that incorporates superior memory handling, windowing features and program protection.

DESQview/X — DESQview/X incorporates the functionality of DESQview and DESQview 386, yet sports a graphical interface that is consistent with the menuing system used by those products. Because of its complete X Window capability, DESQview/X also gives users the capability to run local X Clients as well as access to DOS or Microsoft Windows applications and X Clients on remote machines (using the appropriate network software).

DESQview/X and OSF/Motif, OPEN LOOK Window Managers — When DESQview/X is joined by either the OSF/Motif or an OPEN LOOK window manager, users will have a consistent look and feel across all machines on a network, from DOS machines (DESQview/X) to X Terminals, Unix workstations, minis and mainframes.

4.13 DESQview/X System Capabilities

The capabilities of a DESQview/X system outlined in the preceding sections can be dependent on many factors. Consequently, here is a table of DESQview/X's capabilities:

DESQview/X Capabilities		386 486
Remote X Client, Remote DOS Application or Remote Microsoft Windows and Application		W
Local X Client	Real Mode	W
	16-bit Protected	W
	32-bit Protected	W
Local Well-behaved DOS Text Application or Local Ill-behaved DOS Text Application with Loader	Real Mode	W**
	16-bit Protected	W**
	32-bit Protected	W**
Local Ill-behaved DOS Text Application	Real Mode	W**
	16-bit Protected	WD**
	32-bit Protected	WD**
Local DOS Graphical Application	Real Mode	D
	16-bit Protected	D
	32-bit Protected	D
Local Microsoft Windows 3.0, 3.1 and Windows Application	Real Mode*	W**
	Standard Mode	W**

W Application can be displayed in an X window and can act as a remote X Client for another X Server on a network.
D Application can only be displayed direct and cannot act as a remote X Client for another X Server on a network.
WD Dependent on individual application - most run as W, some may run as D.
\- Processor cannot support this type of application.
* Available only with Microsoft Windows version 3.0.
** Application may be run as a direct window (full screen) for fastest performance.

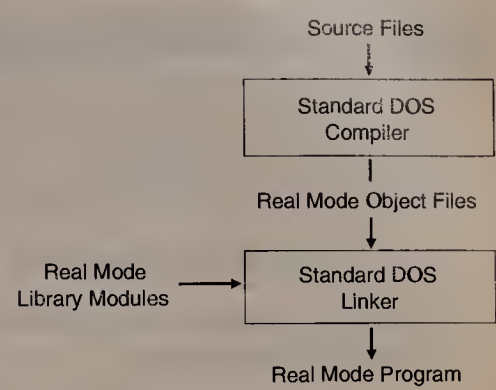
5 Development Issues

This section outlines the development procedures for the different program types that DESQview/X supports and examines how these relate to the development of X Clients under DESQview/X.

DESQview/X supports the following kinds of applications: DOS text (regular DOS applications), DOS graphical (regular DOS graphical applications), DESQview API, Microsoft Windows and of course, X Clients. Most of these application types can appear as either real mode, 16-bit protected or 32-bit protected.

5.1 Real Mode Applications Development

In order to generate a real mode application, a developer will follow the traditional steps to produce an application:



First, all necessary source files are compiled using a regular DOS compiler to create real mode object files. Next, a regular DOS linker is used to link those object files with real mode library modules to produce a runnable application.

Often the compiler, linker and library modules are supplied by a single manufacturer as a complete package.

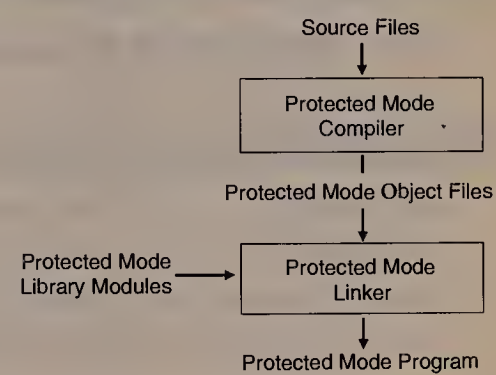
Library modules are available (sometimes from third party manufacturers) with graphic routines to produce a graphical application or Microsoft Windows routines to produce a Windows application.

5.2 Protected Mode Applications Development

To generate a protected mode application for DOS, a developer will require the use of a DOS Extender package and normally follows one of two paths.

5.2.1 Using a Protected Mode Compiler and Linker

If a protected mode compiler is used, it will generate protected mode object files. (Note that the words "protected mode" in the name "protected mode compiler" are referring to the kind of output the compiler generates, not the kind of program the compiler may be - it could actually be a real mode program or a protected mode program running under a DOS Extender!)



These protected mode object files are then linked with protected mode library files and DOS Extender modules to create a protected mode application that is runnable from DOS.

Typically the compiler, linker and library modules are supplied by a single manufacturer as a complete package.

- If a 16-bit protected mode application is required, then a compiler and linker capable of handling 16-bit protected code must be used as should 16-bit protected library modules.
- For a 32-bit protected mode application, a compiler and linker capable of handling 32-bit protected code must be used as should 32-bit protected library modules.

As in the case of real mode applications, library modules are available (sometimes from third party manufacturers) with graphic routines to produce a graphical application or Microsoft Windows routines to produce a Windows application.

Note that a trend in protected mode compilers is to offer a DOS Extender as part of the compiler package, obviating the need to choose and purchase a DOS Extender separately.

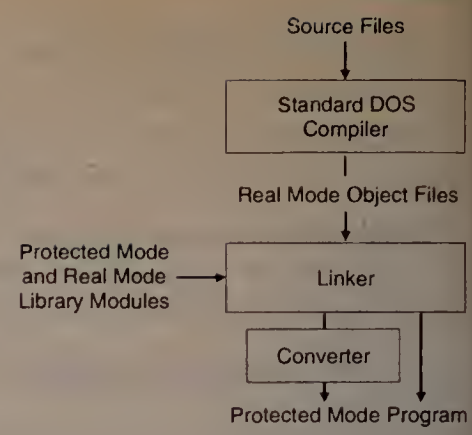
Previously, there was not as big a selection of 16-bit and 32-bit protected mode development packages as there are today. To address this situation, many DOS Extender manufacturers supply an alternate route: using regular DOS compilers.

5.2.2 Using a Regular DOS Compiler

If a regular DOS compiler is used, this will create real mode object files. This may seem inconsistent, however real mode is very similar to 16-bit protected mode code, save for a few constraints. Note that if generating code for a 32-bit environment, using a regular (16-bit) DOS compiler will result in code that will not take advantage of the 32-bit architecture of the processor.

At this point either a regular DOS linker or a protected mode linker may be used. Whatever linker is used, it will typically link in real mode library routines and some protected mode modules as well in addition to the DOS Extender modules. The real mode library routines are ones supplied by the regular DOS compiler manufacturer that do not violate protected

mode guidelines and hence may be used in a protected mode environment. Any library modules that do violate those guidelines are replaced by modules that have been rewritten by the DOS Extender manufacturers and are linked in as protected mode modules.



Sometimes it may be necessary to run a conversion program after the linking stage to create the final protected mode program.

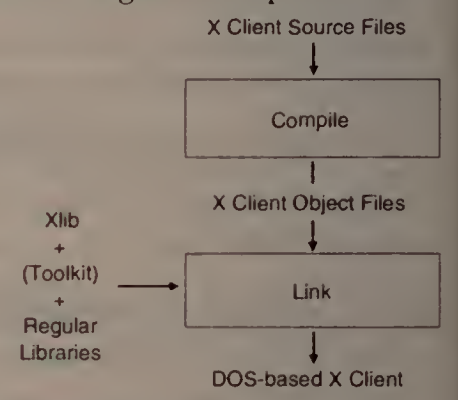
Note that a need for protected mode linkers has become apparent because many regular DOS linkers have certain limitations when creating protected mode programs (since they were not designed to produce these kinds of programs).

5.2.3 DOS Extenders

In order for a protected mode application to run under DOS (or DESQview/X) it requires the use of a DOS Extender. A third-party DOS Extender may be used, though many compilers now supply their own DOS Extender and protected mode libraries. DESQview/X includes the DOS/4GX DOS Extender and the DESQview/X Development Kits (see later) supply the necessary protected mode libraries.

5.3 X Client Development for DESQview/X

Developing or porting X Clients to the DESQview/X platform requires a developer to follow the general steps outlined in the previous section.



Depending on the size of the resultant X Client, a developer will create either a real mode, 16-bit protected mode or 32-bit protected mode application. Typically, X Clients that are ported from another environment (usually Unix) will be implemented the easiest as a 32-bit protected mode application.

In order to create an X Client as opposed to a regular DOS or DOS Extended application, the X Client object files are linked with Xlib and/or Toolkit function libraries in addition to the usual program libraries.

5.3.1 DESQview/X Development Kits

The development kits that are (or will be) available for the development of X Clients in DESQview/X are:

X11	includes XLIB, Xt Intrinsics, Athena Toolkit and sample X Clients.
OSF/Motif	add on to X11 Toolkit
OPEN LOOK	add on to X11 Toolkit

Each development tookit includes different versions of the program libraries for use by particular compilers. The versions that are (or will be) available include:

Library	Real Mode	16-bit Protected	32-bit Protected
X11	B,M,Z	B,IC,M,Z	G,HiC,W
OSF/Motif	-	?	?
OPEN LOOK	-	?	?

B	Borland C/C++ 3.1	M	Microsoft C version 5.1 or 6.x
G	GNU C/C++	W	Watcom C/386 9.0
HiC	Metaware High C 1.7 or 3.0	Z	Zortech C/C++ 3.0
IC	Rational Systems Instant-C	?	Not determined yet

OSF/Motif and OPEN LOOK libraries will not be supplied for use by real mode applications due to the size of their libraries.

Rational Instant-C is of interest in that it is an incremental compiler - it recompiles functions as they are changed to provide a fast development environment much like interpreted BASIC. For final code, however, a program should then be compiled with a fully-optimizing compiler such as Microsoft C.

This table is by no means exhaustive and is expected to change - check with Quarterdeck Office Systems for a list of compilers/program modes currently supported.

5.3.2 DOS/4GX Support

Because DESQview/X contains DOS/4GX DOS Extender technology, a separate DOS Extender is not required for use with the DESQview/X Development Kits. Compilers supported by the DESQview/X Development Kits produce code that is compatible with the DOS/4GX support.

DESQview/X Products

There are several products available in the DESQview/X suite of system software - base products, additional window managers, development kits and additional network manager product.

Contact Quarterdeck Office Systems Customer Service at (800) 354-3222 for a complete list of products and services offered as well as current list prices.

DESQview/X (for 386 PCs)

This product enables a single user to implement on a 386 processor (or better), the DESQview/X graphical environment system for running DOS, Microsoft Windows and/or DOS-based X Clients. In addition, remote computing facilities are provided so that the DESQview/X system can interact with other DESQview/X systems using either a Novell (IPX/SPX) or NetBIOS network. Specifically, a DESQview/X system may use remote DOS, Microsoft Windows or DOS-based X Clients on other DESQview/X systems as well as being able to transfer files.

It includes QEMM-386, Quarterdeck Manifest, the X Server product, the DESQview/X Window Manager (DWM), several graphical utilities (the DESQview/X Companions - Application Manager, File Manager, Icon Editor and Adobe Type Manager) and support software such as a Print Manager and DESQview/X to DESQview/X Network Manage for IPX/SPX and NetBIOS.

OSF/Motif Window Manager

An addition to the DESQview/X base product, the OSF/Motif Window Manager replaces the default DWM window manager to sport an OSF/Motif look and feel.

OPEN LOOK Window Manager

An addition to the DESQview/X base product, the OPEN LOOK Window Manager replaces the default DWM window manager to sport an OPEN LOOK style interface.

DESQview/X Network Manager - DESQview/X to Other X Systems

This network software product is an addition to the DESQview/X base product and enables a DESQview/X system to communicate with other X machines (DESQview/X or otherwise) over a variety of networks. Note that the DESQview/X base product includes support for NetBIOS and IPX/SPX (Novell) networks - this additional package delivers support for other network APIs such as PC/TCP (FTP Systems) and LAN WorkPlace for DOS (Novell) and includes a coupon for a free copy of Novell's TCP/IP Kernel for DOS. Since this list may change, check with Quarterdeck Office Systems for an up-to-date list of network APIs that DESQview/X supports.

Note that this package permits a DESQview/X system to communicate with other DESQview/X and X Window machines over a network. It is not a substitute for and does not replace the standard network software that is required to form a network.

DESQview/X X11 Toolkit

The DESQview/X X11 Toolkit enables developers to port existing X Clients to the DESQview/X platform or create new ones. This kit contains the X11 program libraries for all supported compilers (Xlib, the Xt Intrinsics, the Athena Toolkit) and sample X Clients. In addition, the kit includes the DOS/4GX Extender tools, Rational System's Instant-C and Oxygen utility, full printed documentation, and developer support from Quarterdeck Office Systems.

Check with Quarterdeck Office Systems for a list of compilers/program modes currently supported for this and other development kits.

DESQview/X X11 Library Kit

The DESQview/X X11 Library Kit is a less expensive version of the DESQview/X X11 Toolkit that does not include Rational System's Instant-C and Oxygen utility. In addition it only includes standard 90-day end user support from QOS.

DESQview/X X11 Starter Kit

The DESQview/X X11 Starter Kit consists of the GNU C/C++ compiler and GNU versions of the DESQview/X X11 Libraries (Xlib, Xt Intrinsics and Athena Widgets). In addition, minimal printed documentation is included that describes compiling X Clients as well as specific details on programming and configuring the DESQview/X environment. No documentation regarding generic X Window programming is supplied with this kit.

Even though this kit does not include the DOS/4GX Extender tools, 32-bit protected mode applications may be developed as the GNU compiler includes its own DOS Extender.

This kit is provided at a very competitive and inexpensive price and only includes standard 90-day end user support from QOS.

DESQview/X OSF/Motif Toolkit

An addition to the DESQview/X X11 development kits, the OSF/Motif Toolkit enables developers to create applications with an OSF/Motif look and feel. It consists of the OSF/Motif program libraries, the DESQview/X OSF/Motif Window Manager, Motif and DESQview/X Programming manuals at a very attractive price.

Check with Quarterdeck Office Systems for a list of compilers/program modes currently supported for this development kit.

DESQview/X Developer Passport Support

DESQview/X Developer Passport Support (included only with the DESQview/X X11 Toolkit and available separately) provides a year of special access to DESQview/X development support technicians and to the DESQview/X porting laboratories. The porting laboratories offer individual personalized assistance when porting to the DESQview/X platform or creating new DESQview/X applications. Two locations currently exist - Santa Monica, California and Chelmsford, England with more planned.

Note that many components of the DESQview/X Development Kits (including developer support) are available separately - please contact Quarterdeck Office Systems for a complete list of products/services and current list prices.

FREE EVALUATION DEVELOPMENT KIT

DESQview/X X11 Libraries for GNU C/C++

The GNU C/C++ versions of the DESQview/X X11 Libraries (Xlib, Xt Intrinsics and Athena Widgets) are available on Internet (anonymous ftp server barnacle.erc.clarkson.edu, qddvx100.zip file (note '100' denotes version 1.00 - this can change) in directory /pub/msdos/djgpp) and from the Quarterdeck Office System BBS ((310) 314-3227). Note that the GNU C/C++ compiler is also available from Internet and the QOS BBS.

Even though this libraries do not include the DOS/4GX Extender tools, 32-bit protected mode applications may be developed as the GNU compiler includes its own DOS Extender.

These libraries are offered free of charge, but include no documentation or support from QOS.

Internet Downloading Instructions

FTP users:

```
File location:
    host:      barnacle.erc.clarkson.edu
    login:     ftp
    password:  <your email address>
    directory: ~ftp/pub/msdos/djgpp
```

Non-FTP users:

```
% mail archive-server@barnacle.erc.clarkson.edu
Subject: <none>
help
index msdos/djgpp
<ctrl-D>
```

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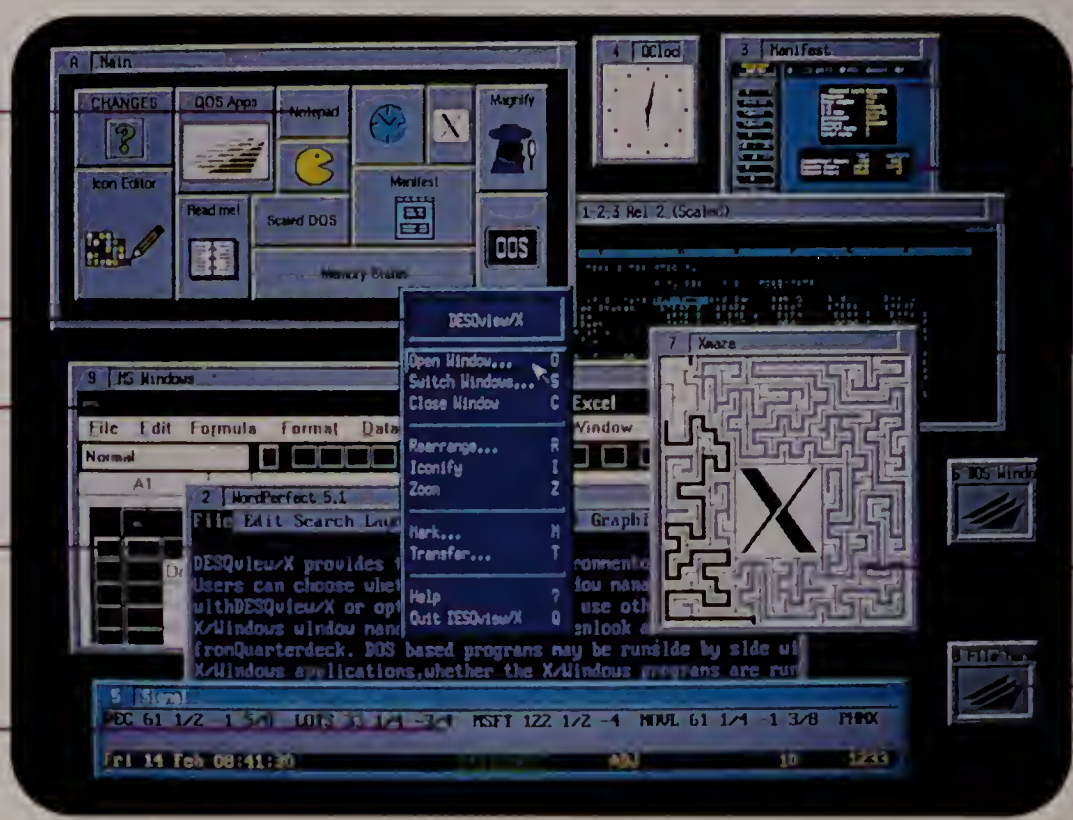

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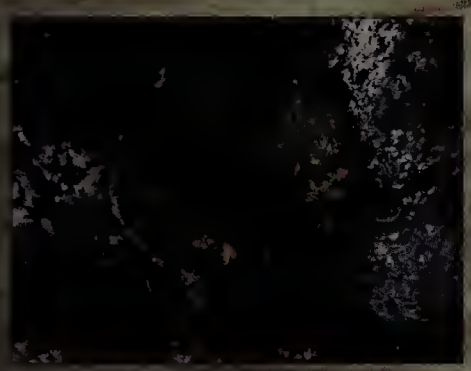

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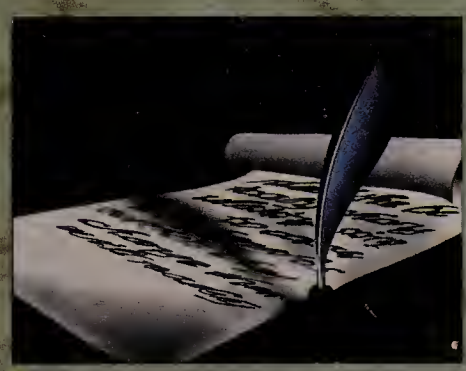

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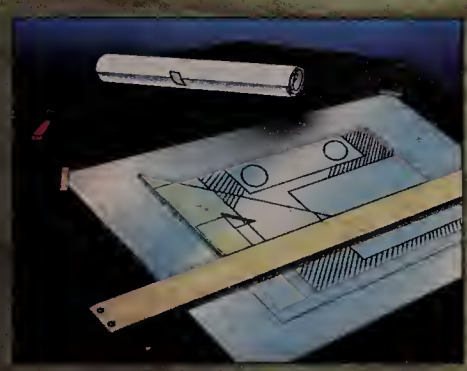

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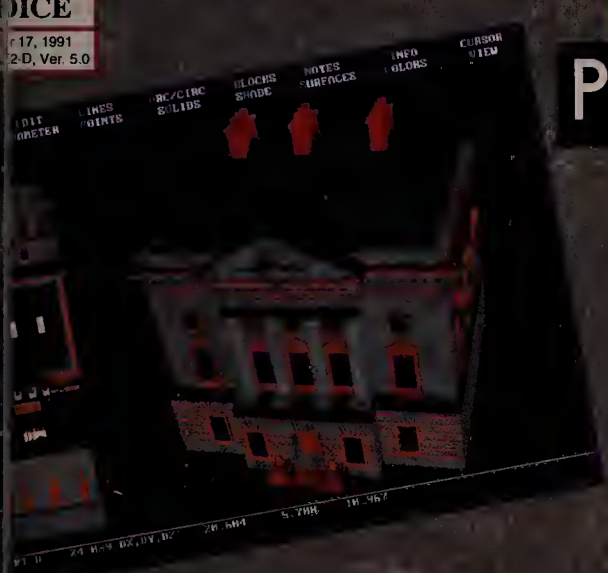

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PUBLISHING & PRESENTATIONS Q & A

Hanging Indents With PageMaker

Q I enjoy the make-overs you do, and I get a lot of ideas from them. But I'd really like to see more tips on using the publishing and presentation applications in our office. Lately, I've had trouble creating a one-line hanging indent in *PageMaker 4.0*. Although I've looked through the documentation, I still can't figure out how to get the first line in a paragraph to extend outside the left margin. I'd like to use this effect to highlight changes in legal contracts.

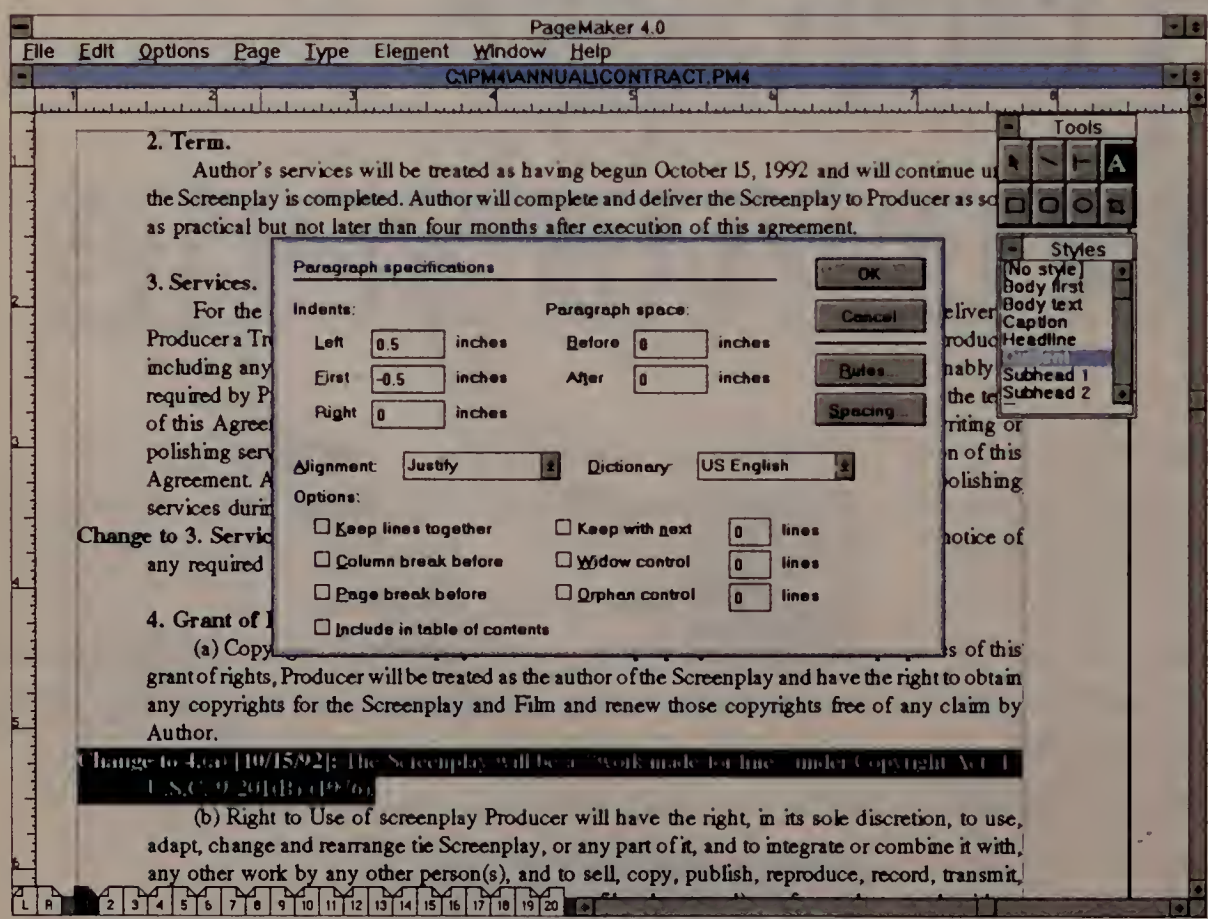
Scott Campbell
Walnut Creek, California

A First, I'm delighted you've found the make-overs useful, and I'd like to thank all the readers who've sent in their make-over candidates. Second, your request for more help on using specific applications has not fallen on deaf ears. Beginning with this installment of *Publishing & Presentations*, and continuing on alternating months, I'll be answering questions submitted by readers. But we haven't abandoned our make-overs; look for the next one in January 1993.

As to your query, don't worry. It's *PageMaker*'s fault, not yours. The problem is, *PageMaker* won't let you extend text to the left of a text block to create the type of hanging indent, or *outdent* as it's often called, that you want. The trick is to indent all the text except the paragraphs you want to appear with an outdent and then apply an outdent style to those paragraphs.

Let's say you want to create a first-line outdent that extends ½ inch outside the left margin. Follow these steps:

1. Select the *Type • Define styles* command or press **<Ctrl>-3** to open the Define styles dialog box.
2. Choose the *Body text* style and click *Edit* to open the Edit style box.
3. Click *Para* to open the Paragraph specifications box, and change the setting for the left indent to **0.5** inches.
4. Click *OK* twice, and repeat steps 2 and 3 for the other style tags used in the document, such as subheads.
5. After you finish changing the left indent for the other tags, click *New* in the Define styles box and enter a new style name, such as **Outdent.**
6. Click *Para* to open Paragraph specifications, and change the left indent to **0.5** inches and the first line indent to **−0.5** inches. Click *OK* three times to close the Define styles box.
7. Apply the *Outdent* style to each of the paragraphs in your document that you want to outdent. All the text in your document is now indented ½ inch, except for the first line of each outdent.



With PageMaker 4.0, you can make the first line of a paragraph hang in the left margin to create a hanging indent, or outdent. The trick: Use the settings in the Paragraph specifications box to indent the paragraph and enter a negative value for its first-line indent.

High-Res Pages on a Shoestring

Q We want to make layouts and then send the document files to our desktop publishing service bureau for high-resolution typeset output, which we'll use for subsequent press runs. The printer's equipment outputs *PageMaker* files without a hitch, but we don't want to wrestle with high-powered professional software. Is there any lower-end publishing software that produces *PageMaker*-compatible files?

Zim Le, Rolla, Missouri

A Despite what your service bureau may have told you, *PageMaker*'s not the only game in town. In fact, almost any service bureau will be equipped with PostScript-compatible typesetting machines (such as a Linotronic imagesetter). That means all you need for high-resolution output is a printable PostScript file, which most shops will accept on disk or via modem.

These days a growing selection of low-end publishing programs let you create a document and save it as a printable PostScript file. If you're a *Windows* user, your choices include *ExpressPage* (Carberry Technology, 508/970-5358), *Express Publisher* (Power Up Software, 415/345-5900), *Microsoft Publisher* (Microsoft Corp., 800/426-9400), *PagePlus* (Serif, Inc., 603/889-8650), and *PFS:First Publisher for Windows* (Spinnaker, 800/826-0706). DOS PostScript-compatible low-end packages include *Express Publisher* (Power Up Software,

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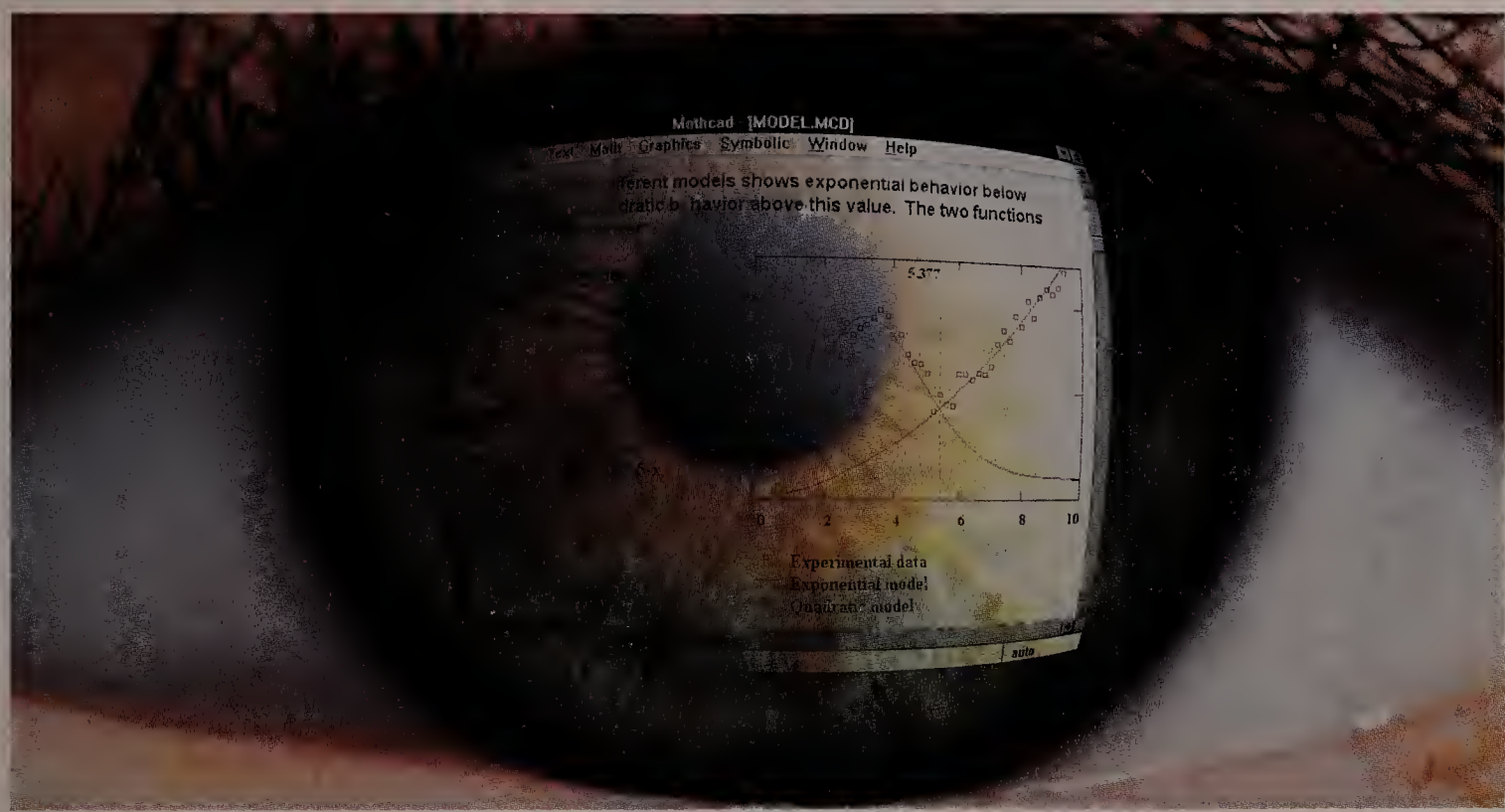

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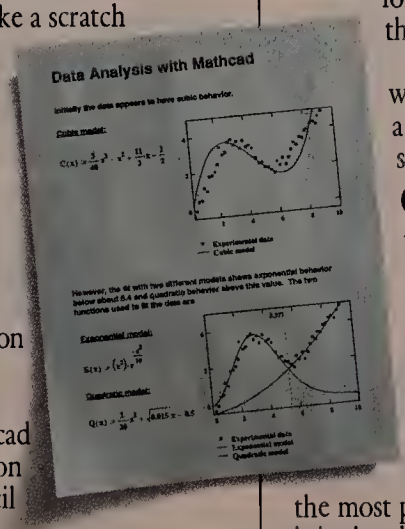

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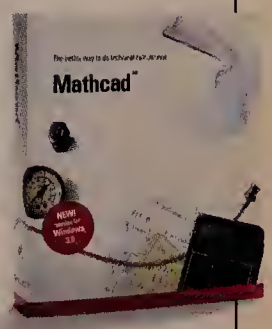

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415/345-5900), *Publish-It* (Timeworks, Inc. 800/323-7744), and *PFS:First Publisher* (Spinnaker).

Harvard Outlines Made Easy

Q I'm a recent convert from the DOS version of *Harvard Graphics* to the *Windows* version, but I'm confused about one thing. I thought *Windows* program files were compatible with one another, but I've had trouble trying to import a word processing file from *Ami Pro* to *Harvard*. I was hoping I wouldn't have to re-create the outline from scratch inside *Harvard*. Can you help?
Rosemary Hocij, Lansing, Michigan

A Don't give up yet. Chances are you've been trying to import the outline after saving it in *Ami Pro*'s native file format rather than as a standard ASCII file. Here are some pointers:

To prepare your text for easy import into *Harvard*'s outliner, put each topic on a separate line and use a single carriage return to separate topics. Use indented lines with tabs to indicate bulleted text items. Save the file in ASCII format without any text styles, such as bold or italic.

In *Harvard*, select *File•New presentation*, then *View•Outliner*. Place the cursor on the first line and choose *File•Import* to select your ASCII text file. Click *OK* and *Harvard* will convert the text into its own outline format and automatically create a slide for each line of text.

Edited by Richard Jantz

Mail your publishing and presentations questions to Publishing & Presentations, *Q&A*, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Publishing & Presentations; MCI Mail, RJANTZ; or 415/442-1891 (fax). Send make-over candidates, preferably clean and unfolded, to* Publishing & Presentations, *Make-Overs, at the above address.* PC World *pays $50 for published questions and make-overs. Sorry, we cannot acknowledge unpublished materials.*

Contributing Editor Richard Jantz is a computer publishing consultant in Berkeley, California. ■

USER GROUP TIP

Corel Conversions

If you want to bring special text effects from *CorelDraw 3.0* into *WordPerfect 5.1* for DOS, you've got a problem; *WordPerfect* can't use *CorelDraw*'s native CDR format, and the export routines can create unwanted results.

Here's a solution: After you create a text object in *CorelDraw*, use the *Arrange • Convert To Curves* command, then select *File • Export*, and export your image as a CGM or PCX file. (If you use PCX, a Bitmap Export dialog box will let you define the image's resolution and other options. You may want to experiment to find out what looks best on your printer.) You shouldn't have any trouble importing this new file into *WordPerfect*.

Anne Ehrenshaft
East Tennessee PC Users Group

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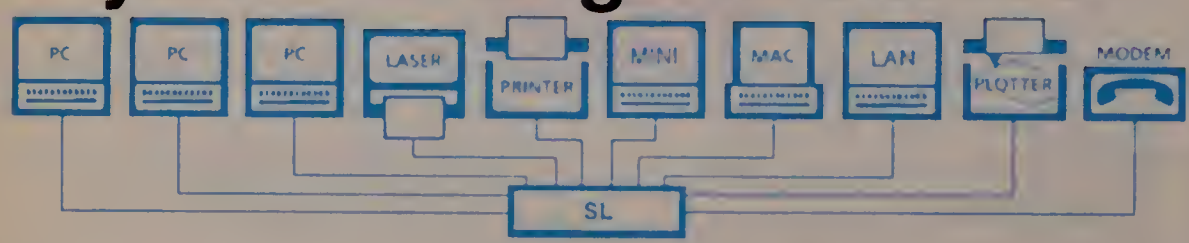

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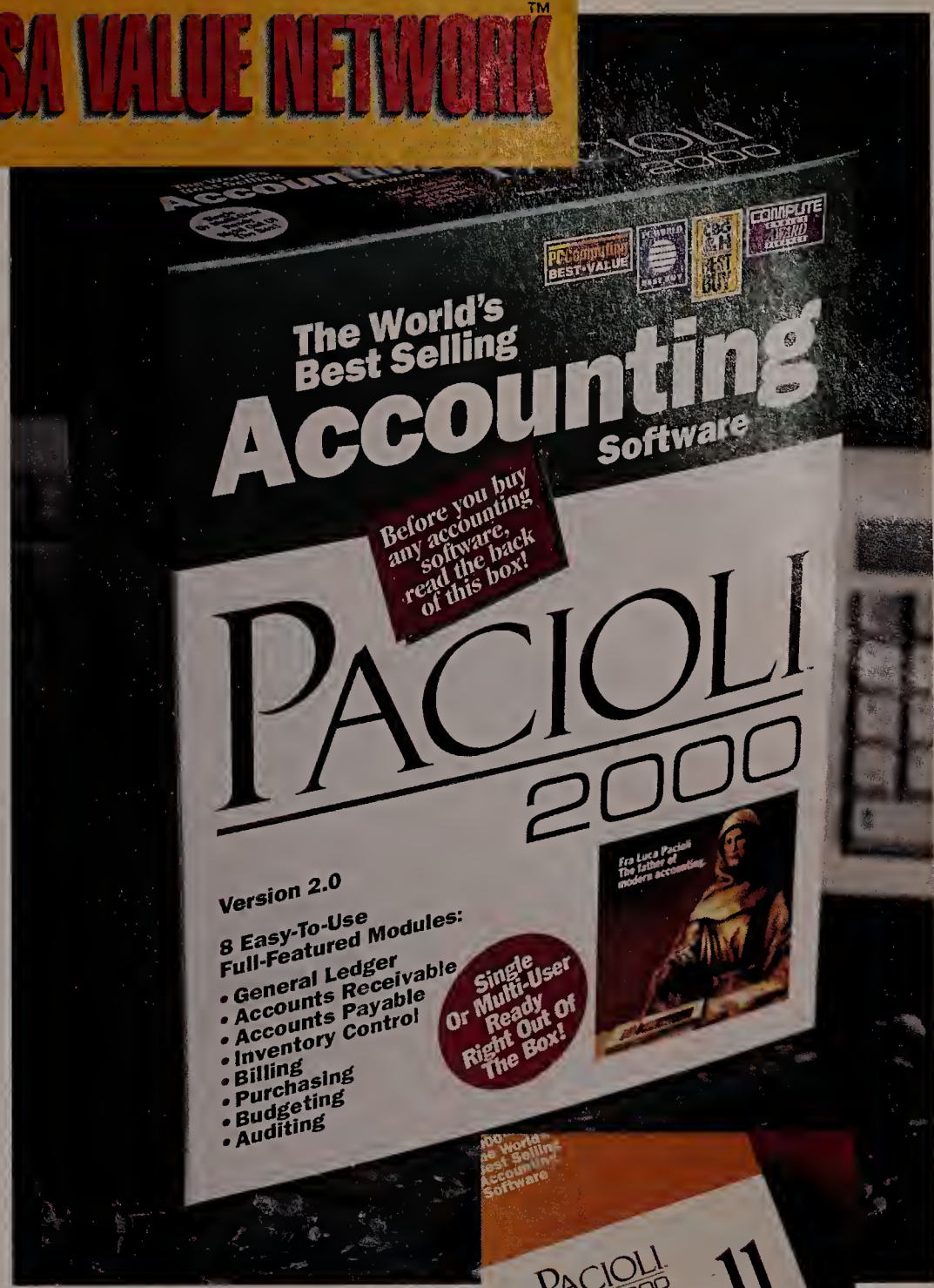

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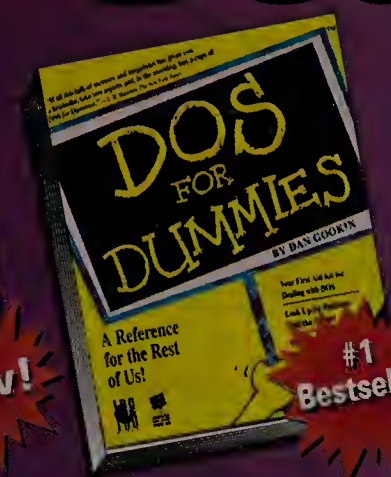

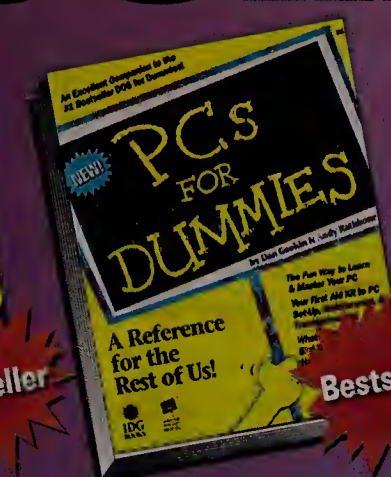

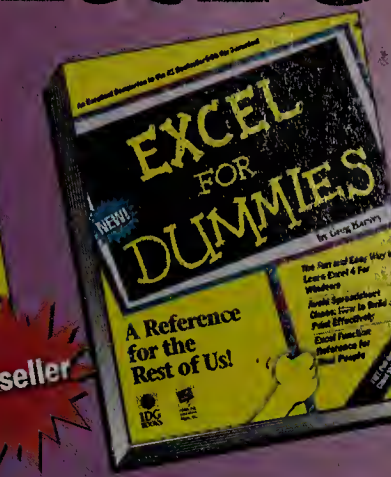

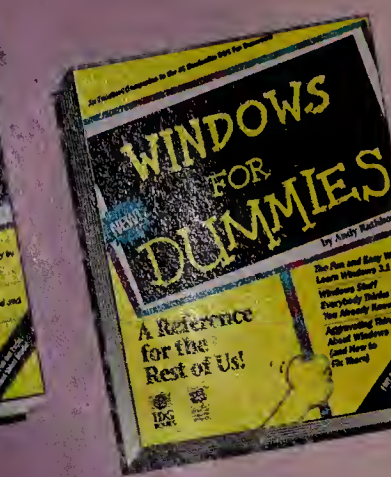

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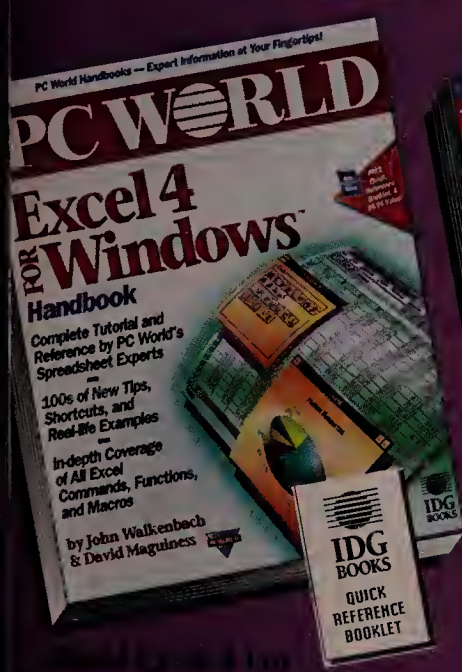

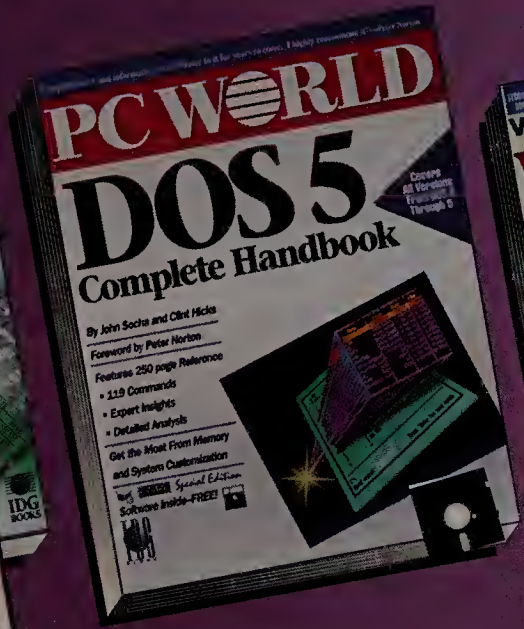

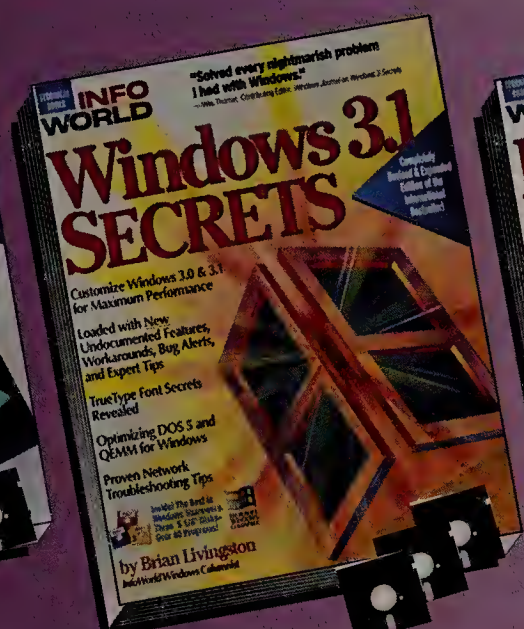

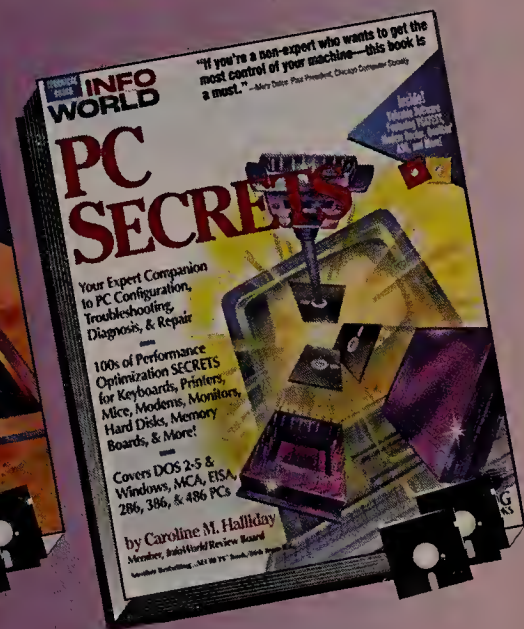

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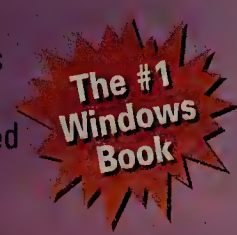

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COMMUNICATIONS Q & A

Viruses on Line?

Q Can my PC become infected with a virus when I'm reading E-mail messages on on-line services such as GEnie and CompuServe? How about when I'm downloading software?
Jim Achtor, San Bernadino, California

A The answers are no, and yes, but you probably don't have to worry. A while back, a prankster posted a message on an on-line service about a "secret 300-bps subchannel" through which a computer virus could sneak into your PC. Before long this tall tale was retold as fact. But the very idea of a "secret 300-bps subchannel," or of catching a computer virus while scrolling through E-mail messages, is a technical absurdity.

A computer virus is a noxious, uninvited program that replicates while spreading through a computer or network in order to wreak havoc. To catch one from another computer, the program code must be passed between the two systems. That can happen only if the computers transfer a binary file or swap floppies.

While your PC can become infected with a virus by downloading software from an on-line service, it cannot get a virus by scrolling through messages—even if the computers that run the on-line service are infected.

The one caveat to this is on-line services, such as Prodigy and America Online, that shuttle program code to your PC to update its communications software. In theory, you could contract a virus from these services just by logging on, but for that to happen the service must be infected with a virus, and that's unlikely.

So far, no virus has ever spread through a commercial on-line service: Viruses are most prolific in large corporate networks. You can avoid them by practicing *safe data exchange*. Whenever you put a foreign disk in your machine, immediately check it for viruses, and download software only from full-fledged commercial systems—such as CompuServe and GEnie—or BBS's where you're certain that someone competent has screened all the files.

Tweaking Your Modem for Faster Data

Q I read there is something called MNP that I can switch off to speed up my modem. What is it, and how do I turn it off? Do I have to put it in a script or macro or something?
John R. Billheim, Kansas City, Kansas

A You don't want to turn off all your modem's Microcom Networking Protocol (MNP). It provides both error correction and data compression. If you're transferring files that are already compressed with an archive program like *LHARC* or *PKZIP*, turn off MNP's compression component, or, as it's known, MNP Level 5. The double compression slows the transfer. If, however, you're simply reading E-mail, MNP compression will greatly increase your modem's throughput.

A computer virus is a noxious, uninvited program that replicates while spreading throughout a computer or network.

You'll find the command to turn off MNP compression, and leave the rest of MNP activated, in your modem's manual. You can insert the command in the modem initialization string. In the software setup screen, look for the modem settings. You'll find a long string that looks like a program compiler drooled on screen. It begins with 'AT' (that stands for ATtention; all modem commands begin with this), and you can insert the &K3, or whatever your modem's MNP compression-off command is, anywhere in that string.

Note: If your modem also includes the error correction/compression protocol V.42/V.42bis, leave its compression on during file transfers. V.42bis is more intelligent than MNP. Before compressing data, V.42bis checks to see if it's already compressed. If it is, V.42bis sends it on. V.42bis might slow a file transfer by a few characters per second, but its enhanced speed is worth it when scrolling through menus or messages.

Remedies for Weary Hands

Q My hands are getting sore and tired from answering all my E-mail. Any suggestions on how to alleviate the swelling of my knuckles?
Laurie Wiener, Falmouth, Massachusetts

A Ben Gay and a trip to a spa without CompuServe are obvious remedies, but if you must answer all that mail, switch to a communications package with a high level of automation and mousability like Datastorm's *Procomm for Windows* or Microcom's *MicroCourier*, also for *Windows*.

Both have extensive scripting languages for automating chores and on-screen "hot spots" where you click on a symbol or word and the program shoots it back to the remote system. These features let you enter commands or menu choices without keying them in.

Or try New England Therapeutic's Handeze fingerless elastic gloves. They're like support hose for hands, and they work. Order them for $19.95 from Patternworks, 800/438-5464.

Edited by Judy Heim

Mail your communications questions to Communications, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Communications; CompuServe, 75300,713; MCI Mail, 312-7737; Internet, 3127737@mcimail.com; GEnie, JUDY.HEIM; or 415/442-1891 (fax).* PC World *pays $50 for published questions. Sorry, we cannot acknowledge unpublished materials.*

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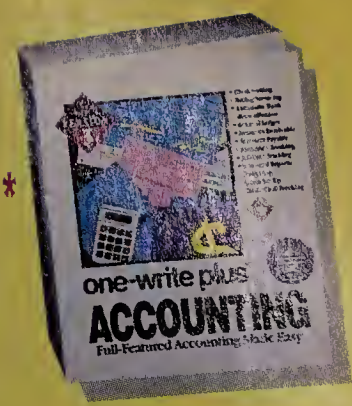

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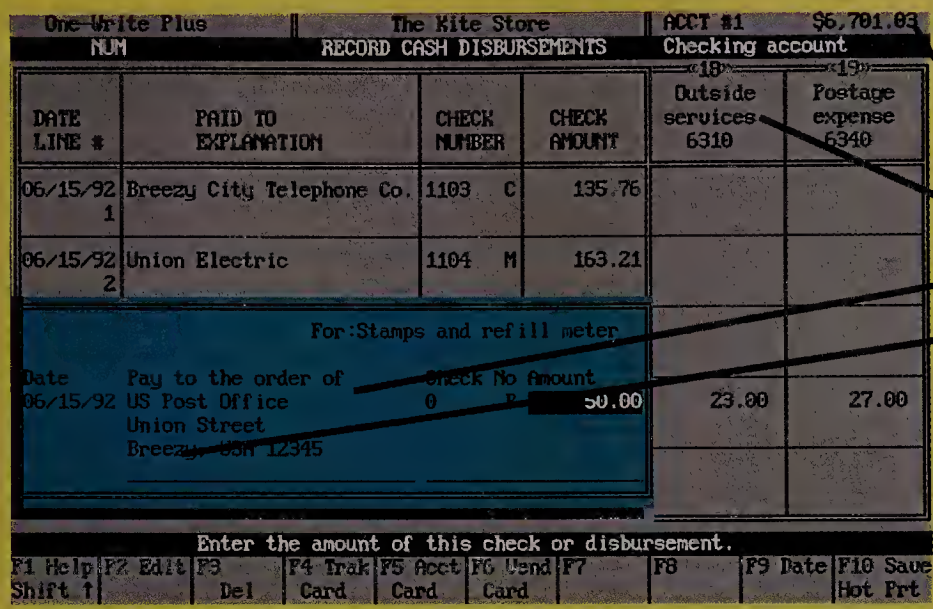

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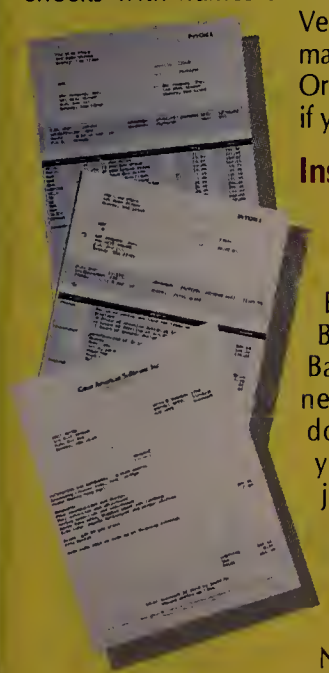

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2	○	○	○	○	○	○	○	○	○	○	
3	○	○	○	○	○	○	○	○	○	○	
4	○	○	○	○	○	○	○	○	○	○	
5	○	○	○	○	○	○	○	○	○	○	
6	○	○	○	○	○	○	○	○	○	○	
7	○	○	○	○	○	○	○	○	○	○	
8	○	○	○	○	○	○	○	○	○	○	
9	○	○	○	○	○	○	○	○	○	○	
0	○	○	○	○	○	○	○	○	○	○	

	Did you read it?		Value to you? (Least 1 – Most 5)				
	All	Some	1	2	3	4	5
Sample	◉	○	○	○	○	○	◉
In This Issue (page 13)	○	○	○	○	○	○	○
Letters (page 17)	○	○	○	○	○	○	○
Consumer Watch (page 25)	○	○	○	○	○	○	○
Real Problems, Real Solutions (page 33)	○	○	○	○	○	○	○
What Next? (page 39)	○	○	○	○	○	○	○
Top of the News (pages 42–56)	○	○	○	○	○	○	○
IBM Gets Aggressive With New PCs (page 42)	○	○	○	○	○	○	○
Quantum 240MB Hardcard EZ (page 45)	○	○	○	○	○	○	○
486DX2 66s Test Drive (page 46)	○	○	○	○	○	○	○
Okidata Doc-It 4000 (page 48)	○	○	○	○	○	○	○
New Products (page 63)	○	○	○	○	○	○	○
Trial Disks: WP Presentations (page 95)	○	○	○	○	○	○	○
Marketplace (page 107)	○	○	○	○	○	○	○
20 Top Upgrades (page 110)	○	○	○	○	○	○	○
Troubleshooting Windows 3.1 (page 128)	○	○	○	○	○	○	○

	Did you read it?		Value to you? (Least 1 – Most 5)				
	All	Some	1	2	3	4	5
486DXs or Upgraded 486SXs? (page 158)	○	○	○	○	○	○	○
Readers Rate Direct-Sale Vendors (page 197)	○	○	○	○	○	○	○
Presentation Software Playoffs (page 208)	○	○	○	○	○	○	○
Budget and Technical Software (page 233)	○	○	○	○	○	○	○
Color LCD Projection Panels (page 249)	○	○	○	○	○	○	○
Help Line (page 256)	○	○	○	○	○	○	○
Spreadsheets (page 262)	○	○	○	○	○	○	○
Word Processing (page 268)	○	○	○	○	○	○	○
Windows (page 272)	○	○	○	○	○	○	○
Data Management (page 278)	○	○	○	○	○	○	○
Publishing & Presentations (page 284)	○	○	○	○	○	○	○
Communications (page 290)	○	○	○	○	○	○	○
Dialog Box (page 296)	○	○	○	○	○	○	○
Instant Reference Card: OS/2 2.0 (page 301)	○	○	○	○	○	○	○
The Home Office (page 344)	○	○	○	○	○	○	○
HOW WOULD YOU RATE THIS ISSUE OVERALL?			○	○	○	○	○

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DIALOG BOX TIPS

Modify Your PATH on the Fly

Keeping a lot of directories in the search path set by your AUTOEXEC.BAT's PATH command is convenient, but it slows your machine and eats up a sizable chunk of your environment. I therefore developed a small batch file that lets you add and remove directories from your PATH on the fly.

NEWPATH.BAT [**LISTING 1**] checks each directory on your search path. If a listed directory doesn't exist, or if it's empty, NEWPATH removes it. Otherwise, the batch file asks you whether you want the directory there. Also, if you pass any directory names to NEWPATH as parameters, the batch file will ask you if those are to be included as well. NEWPATH affects only the search path in memory; your AUTOEXEC.BAT file's PATH command remains unchanged.

Divya Mahajan, New Delhi, India

Editor's note: NEWPATH.BAT is truly useful if you want to quickly exclude a few directories from your search path (or add a few others). It requires two support files: another batch, NEWPATH1.BAT (**LISTING 2**), and a short program, YN.COM, that must be entered via a DEBUG script. YN.COM performs a very simple task: It asks a yes/no question, waits for a 'Y' or an 'N', and returns an errorlevel of 1 for yes and 0 for no. To create YN.COM, enter the text in **LISTING 3** into an ASCII text file called YN.SCR, then run the command **DEBUG < YN.SCR** from the DOS prompt. If you subscribe to PC World Online, you will find both of the batch files, YN.SCR, and the assembled YN.COM in the archive file NOV_DIAG.ZIP.

NEWPATH1.BAT shows how to use the IF EXIST batch command with wild cards. Because IF EXIST succeeds if any files match the pattern shown, and all files match *.*, the test will fail only if the directory is empty or doesn't exist (either way, it's useless in a search path). To test *only* for the existence of a directory, use IF EXIST with a standard device name such as PRN (which, by DOS convention, appears in any directory that exists).

NEWPATH has one drawback: The starting size of your PATH command plus the combined length of your command-line parameters must not exceed 92 characters. If it does, you'll be left with no search path in memory at all.

```
@ECHO OFF
SET A=
FOR %%R IN (%PATH% %1 %2 %3 %4 %5 %6 %7 %8 %9) DO CALL NEWPATH1 %%R
ECHO **************
SET PATH=%A%
PATH
SET A=
ECHO **************
ECHO ON
```

LISTING 1: NEWPATH.BAT lets you check and edit your PATH.

```
IF EXIST %1\*.* GOTO OK
ECHO "%1" IS NOT A DIRECTORY
ECHO OR CONTAINS NO FILES.
GOTO END
:OK
YN INCLUDE %1 (Y/N)?
IF NOT ERRORLEVEL 1 GOTO END
IF NOT "%A%"=="" SET A=%A%;
SET A=%A%%1
:END
ECHO >NUL
```

LISTING 2: NEWPATH1.BAT works with NEWPATH.BAT to check the validity of directories on your PATH.

```
A100
MOV AX, CS
MOV DS, AX
XOR CX, CX
MOV CL,[0080]
MOV DX, 0081
MOV BX, 0001
MOV AH, 40
INT 21
MOV AX, 0C01
INT 21
PUSH AX
MOV AX, 0A0D
MOV [0080], AX
MOV 8X, 0001
MOV DX, 0080
MOV CX, 0002
MOV AH, 40
INT 21
POP AX
AND AL, DF
CMP AL, 59
JNZ 0139
MOV AX, 4C01
INT 21
MOV AX, 4C00
INT 21

NYN.COM
RCX
3E
W
Q
```

LISTING 3: Run YN.SCR through DEBUG to create the program YN.COM.

Getting to the Bottom of WordPerfect

One of my favorite *WordPerfect* tricks lets me use the length of a document, in pages, in a macro. This is useful if you want to put a statement such as "Page *x* of *y*" in a header or footer, or if you need to know the size of the document you'll be faxing or sending via an expensive courier.

The trick involves a macro that goes to the bottom of the file, saves the page number as a variable, then does something useful with the variable. As an example, I've included a macro that

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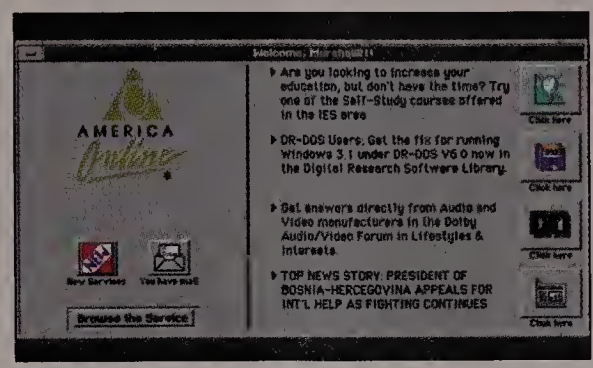
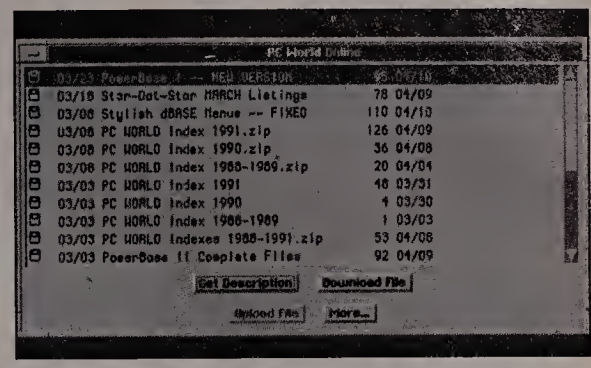


Graphic Windowing Interface



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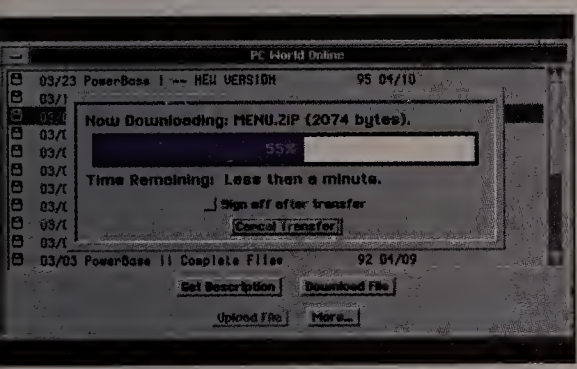

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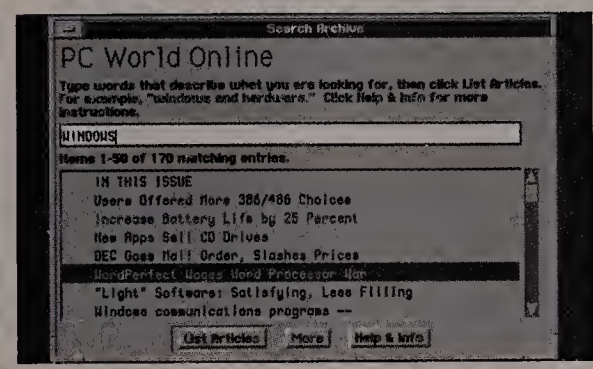

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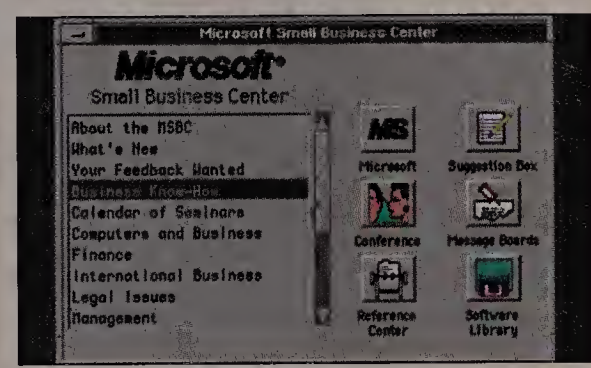

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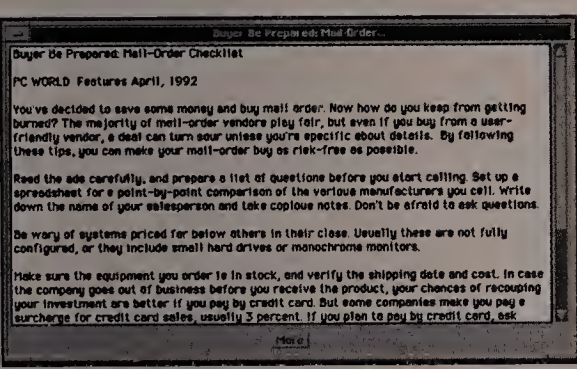

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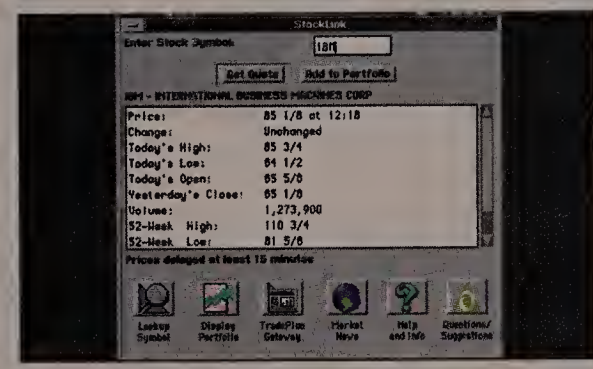

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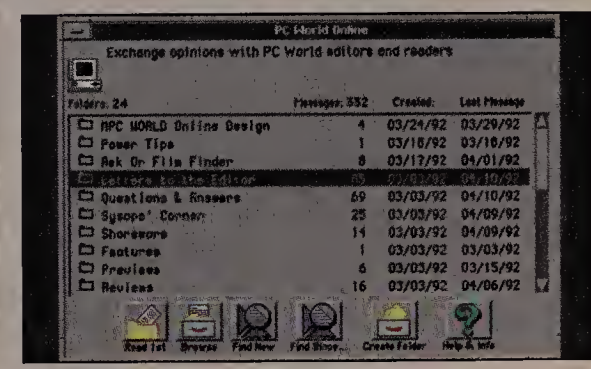

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```
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{Home}{Home}{Home}{Down}
{ASSIGN}LastPage~{SYSTEM}Page--
{Goto}{Goto}
{ON NOT FOUND}{GO}Top--

{Search Left}{Format}PFA{Search}
{IF}{STATE}&512~
   {Backspace}
{ELSE}
   {Backspace}Y
{END IF}
{GO}MakeFoot~

{LABEL}Top~
{Home}{Home}{Home}{Up}

{LABEL}MakeFoot~
{Format}PFAP
Page {^B} of {VARIABLE}LastPage~
{Exit}{Exit}
{Goto}{Goto}
```

LISTING 4: This WordPerfect macro creates a footer that lists the total number of pages in your document.

creates a footer that lists the current page number and the total number of pages [see **LISTING 4**]. If you run the macro just before you print, the number will be accurate.
Neville G. Weekes, Boston

Editor's note: This is an incredibly useful tip if you want to ensure that readers don't mistake a partial document for a complete one. What's more, you can easily adapt the macro to other jobs, like adding a page count to a fax cover sheet. It can even help if you're sending hard copy through the post office: If you know approximately how much your stationery weighs, you can write a macro that computes how much postage you'll need to mail it.

Since this macro uses special commands, you can't create it by simply recording keystrokes; you have to use the macro editor. To get to the macro editor, press **<Home>**, then **<Ctrl>-<F10>**. At the Define Macro prompt, press **<Alt>-P** (assuming that's the keystroke you want to run this macro with). At the Description prompt, type something like **Footer with page total** and press **<Enter>** again to bring up the macro editor. You're now ready to create the macro.

In the *WordPerfect* macro editor, you must

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insert different types of commands in different ways. To insert a command shown here in boldface, press **<Ctrl>-<Page Up>**, select the command from the pop-up list in the upper right corner of the screen, and press **<Enter>**. If a command is shown underlined, press the appropriate key (for example, **F2** for {Search}). For commands that are boldface and underlined, press **<Ctrl>-V**, then the appropriate key (for example, **<Ctrl>-V** then **<Enter>** for {Enter}). Type any other text as it appears.

When the macro is finished, press **<F7>** to exit the macro editor. You can now create or update that footer by simply pressing **<Alt>-P**. If you subscribe to PC World Online, you will find the macro as ALTP.WPM in the archive file NOV_DIAG.ZIP.

Better to Light a Single Cursor . . .

A friend recently asked me to find a program to make his cursor bigger. The only ones I could find were big and memory resident, so I wrote a short program that makes the cursor one to seven scan lines high and doesn't stay in memory [**LISTING 5**]. When you run the program, it prompts you for a single-digit number; if you type anything other than a number from 1 through 7, the cursor is made seven lines high.

Igor Shpak, Brooklyn

Editor's note: We're always pleased to receive programs by youthful contributors; the author of this utility, Igor Shpak, is a 17-year-old Russian immigrant who has been in the United States for three years. His short utility works as advertised; it sets the cursor at one to seven scan lines high. (A scan line is one of the tiny horizontal lines of pixels that make up the image on your screen.) Only one caveat here: Some computers with an unusual or older display adapter or BIOS might produce odd cursor shapes in response to this program. On most machines, however, including all the laptops I tried, it works beautifully.

To create CURSOR.COM, copy **LISTING 5** to a file called **CURSOR.SCR**. Please note that there are no uppercase letter *O*'s in this script; anything that looks like one is a zero. After you enter the script, double-check it for accuracy; I recommend reading down the columns rather than across the lines. When you're sure the file is accurate, type **DEBUG < CURSOR.SCR** at the DOS prompt. CURSOR.COM will appear in the current directory. If you subscribe to PC World Online, you will find both CURSOR.SCR and CURSOR.COM in the archive file NOV_DIAG.ZIP.

```
n cursor.com
E100 EB 1E 45 6E 74 65 72 20
E108 74 68 65 20 73 69 7A 65
E110 20 6F 66 20 61 20 63 75
E118 72 73 6F 72 20 3E 20 24
E120 BA 02 01 B8 00 09 CD 21
E128 B8 00 00 CD 16 B3 30 28
E130 D8 B1 07 B2 01 38 D0 74
E138 04 FE C2 E2 F8 88 CD B1
E140 07 B4 01 CD 10 CD 20
rcx
0047
w
q
```

LISTING 5: Run this file, CURSOR.SCR, through DEBUG to create CURSOR.COM.

Word for Windows Does Deletions

I've used *Word for Windows* for over two years and miss a feature found in most other word processors: File Delete. True, you can delete a file through the File•Find File command, but you first have to wait while *WinWord* searches the disk.

So I wrote a simple macro that deletes any file on any disk. After assigning it to the File menu (where God intended it to be), I can now select File•Delete (which I can do with the mouse or by pressing <Alt>-F, then D), and I'm prompted for a file name. If my macro can't find a file with that name, a dialog box tells me so.

To create this simple menu macro, select *Tools•Macro*, type **DeleteFile**, and click *Edit*. Once you're in the macro editor, type the macro [**LISTING 6**] and select *File•Close•Yes*.

Next, put the macro on the File menu: Select *Tools•Options*, then press **M** to select

```
Sub MAIN
' Delete a file from the disk
Input "File to delete" ; fil$
' Erase the file
If(len(fil$) > 0) Then Kill fil$
End Sub
```

LISTING 6: Use this Word for Windows macro to erase files easily.

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Instant Reference Card #30

For use with PC World Instant Reference Card Portfolio

OS/2 2.0 WORKPLACE SHELL

When OS/2 2.0 starts up, you're looking at the Workplace Shell, the system's object-oriented graphical user interface. While most OS/2 tasks can be accomplished using the keyboard or mouse, some require the mouse.

BASIC MOUSING TERMS USED IN THIS INSTANT REFERENCE CARD

OS/2 makes extensive use of both mouse buttons. By default, *button 1* refers to the left mouse button, *button 2* to the right one. To switch this arrangement, from the desktop open OS/2 System • System Setup • Mouse and select **S**etup • Left-handed.

For each of the following actions, first place the mouse pointer on the object to be affected.

Click	Click either button
Click/1	Click button 1
Click/2	Click button 2
Double-click	Click either button twice in quick succession
Double-click/1	Click button 1 twice in quick succession
Drag	Hold down either button while moving mouse
Drag/1	Hold down button 1 while moving mouse
Drag/2	Hold down button 2 while moving mouse

Fold Here

USING THE WORKPLACE SHELL

When closed, an OS/2 *object* appears as an icon. When open, most objects appear as windows.

Select window	Click/1 or **<Alt>-<Tab>**
Move between window and desktop	Click/1 or **<Alt>-<Shift>-<Tab>**
Select object	Click/1; or select object's window or desktop, use cursor keys to highlight
Open object's menu	Click/2; or select object, **<Shift>-<F10>**
Open object's Settings menu	Open menu, either click arrow to right of word 'Open'; or **<Right>**, **S**ettings
Open folder object or launch program object	Double-click/1; or select object, **<Enter>**
Change selected object's name	**<Shift>-<F9>** or **<Alt>**-click/1 object's name, edit name, click desktop to close
Move object	Drag/2
Copy object	**<Ctrl>**-drag/2
Delete object	Drag/2 to Shredder, **<Enter>**
Create linked copy of object	**<Ctrl>-<Shift>**-drag/2 or open object's menu, Create **s**hadow, select destination
Open Desktop menu	Click/2 on desktop away from icons and windows

SPECIAL OBJECTS

By default, OS/2 displays several commonly used objects on the desktop. Those objects are printed on this Instant Reference Card flush against the left-hand margin. The objects that are shown here indented are, by default, inside the object they're indented under.

Start Here	Get introductory information on OS/2 2.0, including customizing, printing, multitasking, and sharing data
Information	View OS/2 on-line help and command references, including master help index, glossary of terms, tutorial, command reference, and REXX language reference

SPECIAL OBJECTS (continued)

OS/2 System	Access programs, files, and drives
System Setup	Set up or change OS/2 environment
Command Prompts	Select DOS or OS/2 command-line environment or *Windows* emulation; or reboot with DOS on Dual Boot system
Productivity	Run small, bundled applications, including calculator, notepad, miniature data base, miniature spreadsheet, communications program
Drives	View all currently available disk drives
Drive *d*	Display contents of hard disk
Display directory structure as tree	Open object
Display detailed file list	Open menu, either click arrow to right of word 'Open' or **<Right>**, **D**etails view
Format disk	Open menu, **F**ormat disk, select options
Check disk integrity	Open Settings menu, Chec**k** disk, select options
Find file	Open menu, **F**ind, select options
Drive *d*	Display contents of floppy disk
Same options as hard disk icon	
Laser Printer	View/control current laser printer jobs
Print object	Drag/2 file object to printer object, select options
View jobs	Open printer object
Cancel job	View jobs, open menu for job object, **D**elete
Restart job	View jobs, open menu for job object, **S**tart again
Dot Matrix Printer	View/control current dot matrix printer jobs
Same options as laser printer icon	
Templates	Create new object for data files
Create new object	Move desired template to desktop
Startup	Place programs in this folder to launch them automatically when system boots
Minimized Window Viewer	View/restore minimized window

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OS/2 2.0: COMMON TASKS AND COMMAND-LINE USE

WORKING WITH OS/2 WINDOWS

Open window menu	Click icon at left of title bar; click/2 empty part of window; or **<Alt>**, **<Left>**
Close window	Double-click on icon at left of title bar; or **<Alt>-<F4>**
Move window	Drag title bar; or **<Alt>-<F7>**, use cursor keys, **<Enter>**
Resize window	Drag window border; or **<Alt>-<F8>**, use cursor keys to select side/corner and to resize, **<Enter>**
Maximize window	Click icon on title bar; double-click/1 on title bar; or **<Alt>-<F10>**
Restore maximized window to original size	Click icon on title bar; double-click/1 on title bar; or **<Alt>-<F5>**
Minimize window	Click icon on title bar; or **<Alt>-<F9>**
Hide window	Click icon on title bar; or **<Alt>-<F11>**

Note: Some windows can be hidden, and some can be minimized—programs in minimized windows run in the background. OS/2 keeps icons for such programs in the Minimized Window Viewer, not on the desktop.

COMMON WORKPLACE SHELL TASKS

List currently running programs	Click both buttons on desktop simultaneously, or **<Ctrl>-<Esc>**
Password-protect computer	Display Desktop menu, **L**ockup now
Set timer to password-protect computer after n minutes of inactivity	Open Desktop's Settings menu, **L**ockup, select options, close
Change window or desktop color/font	Open OS/2 System • System Setup • Color Palette/Font Palette, click/1 desired color/font, drag/2 onto window or desktop
Change overall window or desktop color scheme	Open OS/2 System • System Setup • Scheme Palette, click/1 desired color scheme, drag/2 onto window or desktop
Prepare to turn off computer	Display Desktop menu, Shut **d**own

Note: Anyone can get around OS/2's built-in password protection by hard-booting the computer.

RUNNING DOS PROGRAMS

Modify settings before running program or session	Open object's Settings menu, **S**ession • DOS **s**ettings, select setting, set value
Set memory size	Modify settings, Setting: DOS_RMSIZE, Value: adjust number
Increase memory beyond 640K	Modify settings, Setting: VIDEO_MODE_RESTRICTION, Value: CGA
Load DOS high	Modify settings, Setting: DOS_HIGH, Value: On
Add session-specific device driver	Modify settings, Setting: DOS_DEVICE, Value: enter CONFIG.SYS-style DEVICE command
Change font size in windowed session	Open window menu, **F**ont Size, change font
Change windowed session to full screen	**<Alt>-<Home>**; or open window menu, **F**ull-Screen
Change full-screen session to windowed	**<Alt>-<Home>**

THE OS/2 COMMAND LINE

The OS/2 command line is virtually identical to DOS's in look and feel, and most commands work the same way. However, DOS users may not be familiar with the following OS/2 commands.

Move file(s) to another directory on same disk	**MOVE** *source destination*
Display MET, PIF, or SPL graphic file	**PICVIEW** *filename*
View information (INF) file	**VIEW** *filename*
Run program or command as another session in background	**DETACH** *command*
Reboot to DOS on Dual Boot system	**BOOT /DOS**
Reboot to OS/2 after booting DOS on Dual Boot system	**C:\OS2\BOOT /OS2**
End OS/2 command-line session	**EXIT**

CUSTOMIZING CONFIG.SYS

The OS/2 CONFIG.SYS file is considerably more complex than its DOS counterpart. From this file you control the relationship of RAM to your disk, how programs share resources, and what the operating system does when it boots up.

Before changing your CONFIG.SYS file, copy the existing file to another name, such as CONFIG.OLD. To edit CONFIG.SYS, either open the CONFIG.SYS object in your root directory window, or type **E C:\CONFIG.SYS** at the OS/2 command line.

Many of the statements below may already exist, with different parameters, in your OS/2 CONFIG.SYS file. Before typing in a statement, make sure a variation of it doesn't already exist. If one does, change that statement rather than adding a new one. Changes made to CONFIG.SYS have no effect until you reboot the computer.

Create nK disk cache that writes to disk immediately	**DISKCACHE=**n
Create nK disk cache that writes to disk only when disk is idle	**DISKCACHE=**n**, LW**
Keep OS/2 from reloading, at boot time, all programs running when system is shut down	**SET RESTARTOBJECTS=NO**
Enable UNDELETE command	Remove 'REM' from REM SET DELDIR= line
Enable/disable RAM swapping to disk	**MEMMAN=SWAP/NOSWAP**
Specify that foreground and background applications have equal disk access	**SET PRIORITY_DISK_IO=OFF**
Tell OS/2 to look for DLL files in *dir*	Add ;*dir* to LIBPATH= line
Tell OS/2 to look for data files in *dir*	Add ;*dir* to SET DPATH= line
Set minimum and maximum time, in milliseconds, that processor can allocate to application while multitasking	**TIMESLICE=***max*, *min*
Set maximum number of independent tasks to *n* (64 to 4096)	**THREADS=***n*

MISCELLANEOUS JOBS

Recover corrupted desktop	During power-up, hold down **<Ctrl>-<Left Shift>-<F1>** until Workplace Shell appears
Show developer's credits	From Workplace Shell, **<Shift>-<Ctrl>-<Alt>-O**

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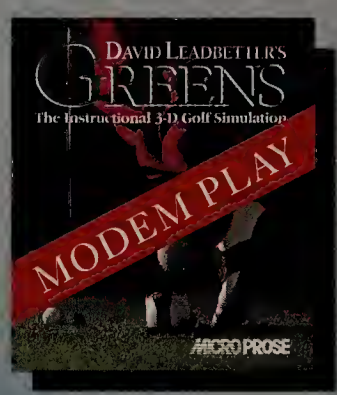

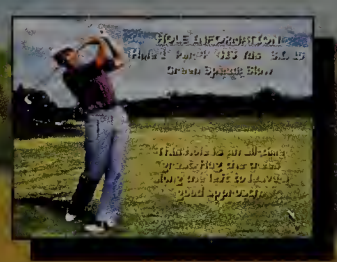

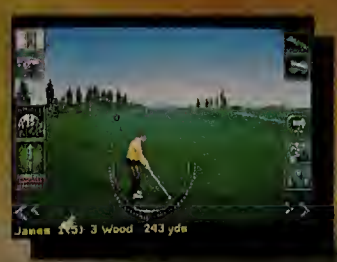

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the Menus category. Make sure the Menu box reads '&File'. Click on *DeleteFile* in the Macros list box and click *Add*. A Delete File item will appear at the bottom of the file menu. Click *Close* to exit.

Greg M. Perry, Tulsa, Oklahoma

Editor's note: This isn't a particularly complicated macro, but it is very useful and shows how you can add new commands to *Word for Windows'* menus. Unfortunately, *Word for Windows'* menu editor does have one awkward feature: You can add new items only at the bottom of the menu, so the new Delete File item winds up at the bottom instead of next to Find File, where you'd expect to find it. The only remedy, and it's a clumsy one, is to delete items, starting at the bottom of the menu, until you've reached the desired insertion point; add the macro; and then replace the items below it. If you do this, keep a pen and paper handy; otherwise, you might forget the names of some of the commands you need to add back.

If you subscribe to PC World Online, you will find the listing, under the name WINWORDM.TXT, in the archive file NOV_DIAG.ZIP.

When SmartDrive Gets Too Smart

If you use a delayed-write cache such as SmartDrive, batch files that write to disk then reboot your system don't work. I discovered this the hard way; luckily, I also discovered a solution.

I boot with different AUTOEXEC.BAT and CONFIG.SYS files, depending on whether I'm going to run *Windows*. To make this easier, I have a batch file, GO.BAT, that swaps my AUTOEXEC.BAT and CONFIG.SYS files, then reboots the system using WARMBOOT.COM (see "Batching the Warm Boot," *User Group Tips*, July 1992).

This worked well until I installed *Windows 3.1*, which automatically adds SmartDrive to the system. Since SmartDrive waits before writing files to disk, my batch file would reboot the computer before it had copied my files. The result? My system would reboot with the same AUTOEXEC.BAT and CONFIG.SYS as before.

My solution is to place three lines at the beginning of the batch file:

```
@ECHO OFF
SMARTDRV /C
SMARTDRV C
```

The second line writes all cached data to disk; the third turns off write-behind caching for drive C:. This ensures that the copy command completes its duties before the system reboots.

William H. McWilliams
Uniontown, Pennsylvania

Editor's note: An unflushed cache—one that holds data that still needs to be written to the disk—creates a very real problem for batch files and programs that reconfigure and reboot your computer: They often fail to function as expected and may even leave you *without* a CONFIG.SYS or AUTOEXEC.BAT file. This situation crops up on machines running SmartDrive, *Norton's* NCACHE, *PowerCache Plus*, and other caches that feature delayed writes (also called write-back or write-behind). It also poses a danger: If you shut off your PC too soon after performing a file operation, the results can be lost and the hard disk can be corrupted.

McWilliams's approach (which I also use on my system) solves the problem—at least in situations where software causes the machine to reboot. However, if you're concerned with shutting off your PC before cached data has been written to disk, simply place his batch fragment in a file called SHUTDOWN.BAT and then run the batch file before you turn your machine off. Note that if you're running a cache other than SmartDrive, the commands needed to flush and disable the cache will be different—but they almost always consist of the name of the caching program followed by a command or command switch. Consult your cache's manual to find the correct command.

Running the Numbers

When using *1-2-3*, I found that I spent lots of time creating columns of successive numbers. I therefore created a simple macro that does it for me [TABLE 1]. To use it, go to the top of your desired range—in other words, the cell where you want the number 1—and enter the number of cells you want to fill. Once entered, press <Alt>-N. The macro will automatically create the column of numbers.

Dominik Tylczynski, Poznan, Poland

Editor's note: This is one of those macros that everyone needs to have but that few take the time to write. It also demonstrates a very powerful way of passing information to a macro: putting information that the macro needs in the current cell just before invoking it.

To create the macro, enter the text into two columns, as shown, anywhere on your worksheet. Remember to first type an apostrophe (') when entering cell contents that begin with a slash (/), backslash (\), or number. Once everything is entered, select */Range•Name•Label•Right*, highlight the range in the first column (A1..A12 in this example), and press <Enter>. If you subscribe to PC World Online, you will find the macro in SUCCESIV.WK1 in the archive file NOV_DIAG.ZIP.

Edited by Brett Glass

	A	B	C	D	E
1	\n	/rnchere~~			
2		{for counter,2,here,1,nsub}			
3		{goto}counter~			
4		XXXX~			
5		{goto}here~			
6		1~			
7		/rndhere~			
8					
9	nsub	{d}			
10		/ccounter~~			
11					
12	counter	XXXX			

TABLE 1: This 1-2-3 macro creates columns of successive numbers.

Have a macro, batch file, short program, or general tip you're proud of? Mail your tips to Dialog Box, PC World, *501 Second St. #600, San Francisco, CA 94107; or send them electronically to PC World Online, Dialog Box; Internet, rogue@well.sf.ca.us; MCI Mail, PC World Editorial; CompuServe, 74055,412; or 415/442-1891 (fax).* PC World *pays $25 to $200 for each tip used. Sorry, we cannot acknowledge unpublished materials.*

Brett Glass is a contributing editor for PC World.

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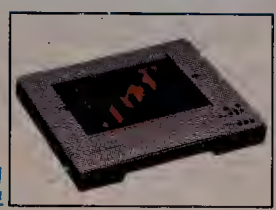

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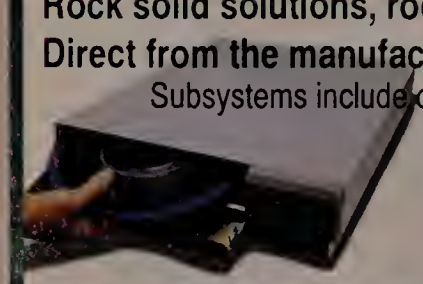

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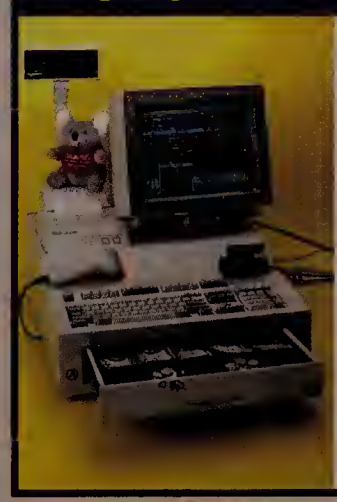

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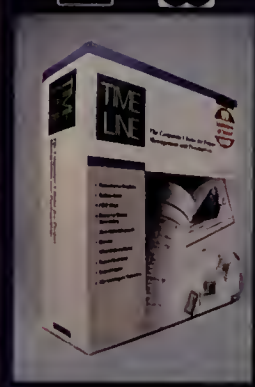

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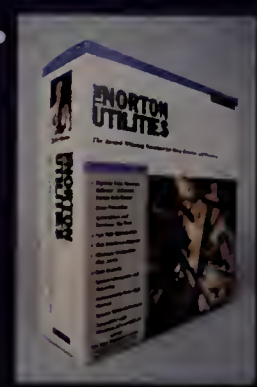

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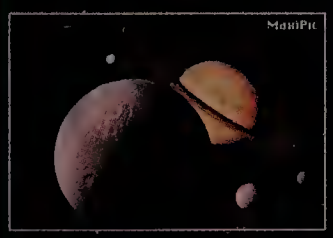

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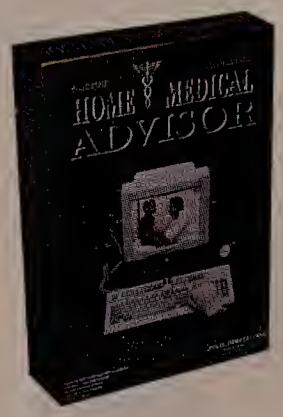

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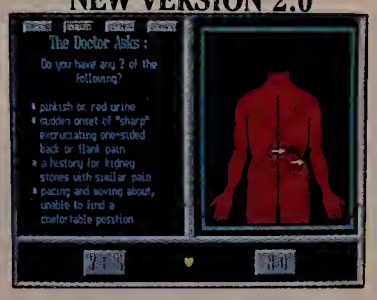

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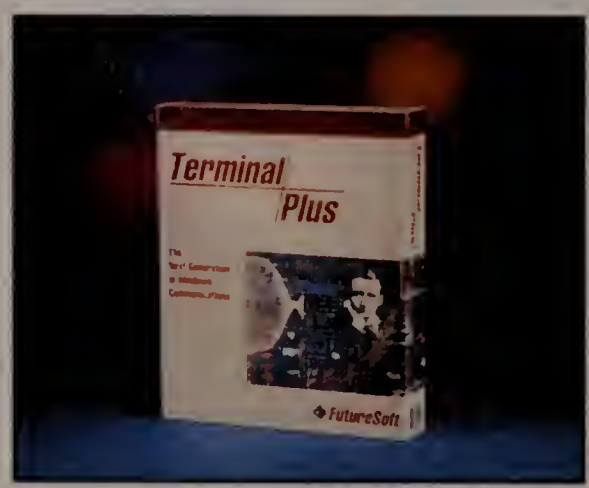

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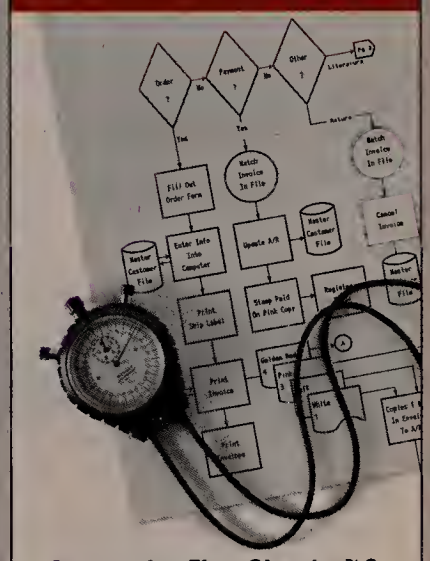

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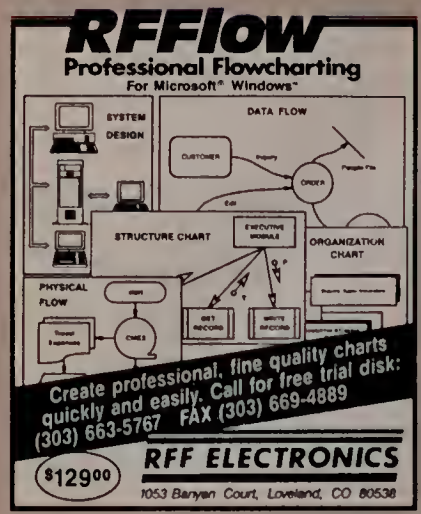

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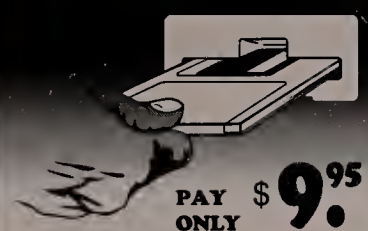

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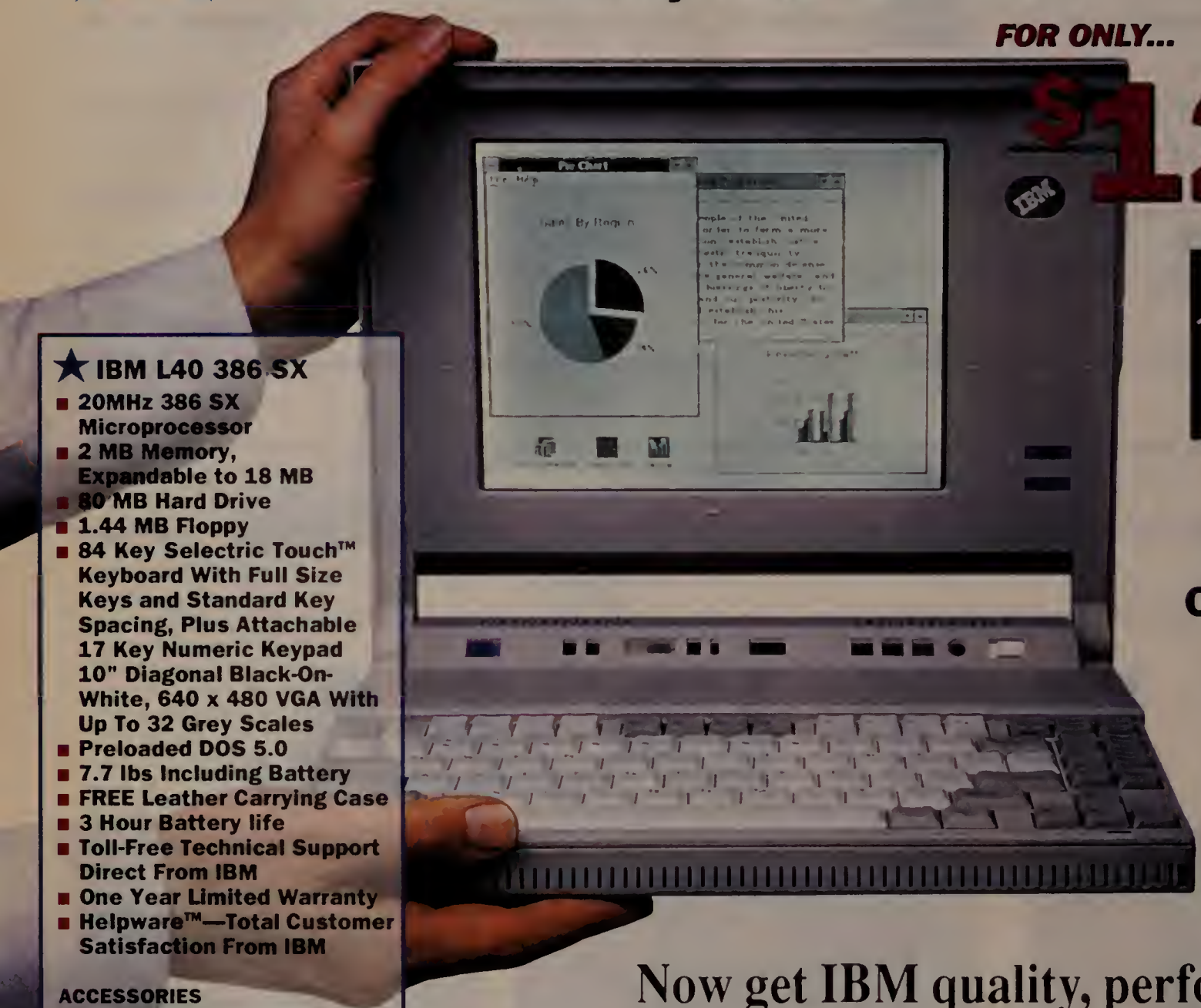

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GAMES

- ☐ Best Arcade Games (2 disks) (1660) - 18 great games. (CGA)
- ☐ Best CGA Tetris Clones (3 disks) (1970) - 16 variations! (CGA)
- ☐ Kids' Games (2317) - Fun for the under 12 set.
- ☐ Super Solitaire (3 disks) (2460) - 19 great versions. (CGA)

EGA/VGA GAMES

Note: These games require EGA or VGA graphics and a Hard Drive.

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- ☐ Best EGA Games 2 (4 disks) (1590) - 15 great EGA games!
- ☐ Best EGA Mouse Solitaire (4 disks) (1930) - 19 fabulous Solitaire card games that use a mouse. (EGA) (Mouse)
- ☐ Best VGA Games 1 (4 disks) (3650) - 14 great VGA games!
- ☐ Best VGA Games 2 (4 disks) (3670) - 14 great VGA games!
- ☐ Best VGA Mouse Games (4 disks) (3660) - 14 great VGA games with fantastic graphics! (VGA) (Mouse)
- ☐ Commander Keen Collection (3 disks) (2240) - Two of the best games of all time! Great graphics & sound. (EGA)
- ☐ Cosmo (2 disks) (1760) - Another great game from Apogee. Great graphics and sound. (EGA)
- ☐ Galactix VGA 1.3 (2 disks) (1540) - VGA space game. (VGA)
- ☐ Jill of the Jungle (1118) - VGA arcade/adventure game. (VGA)
- ☐ Megatron VGA (2 disks) (1530) - Virtual reality makes this the ultimate combat experience! (VGA) (HD)
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WINDOWS 3.0/3.1

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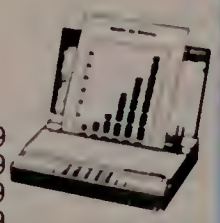

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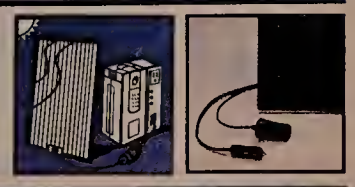

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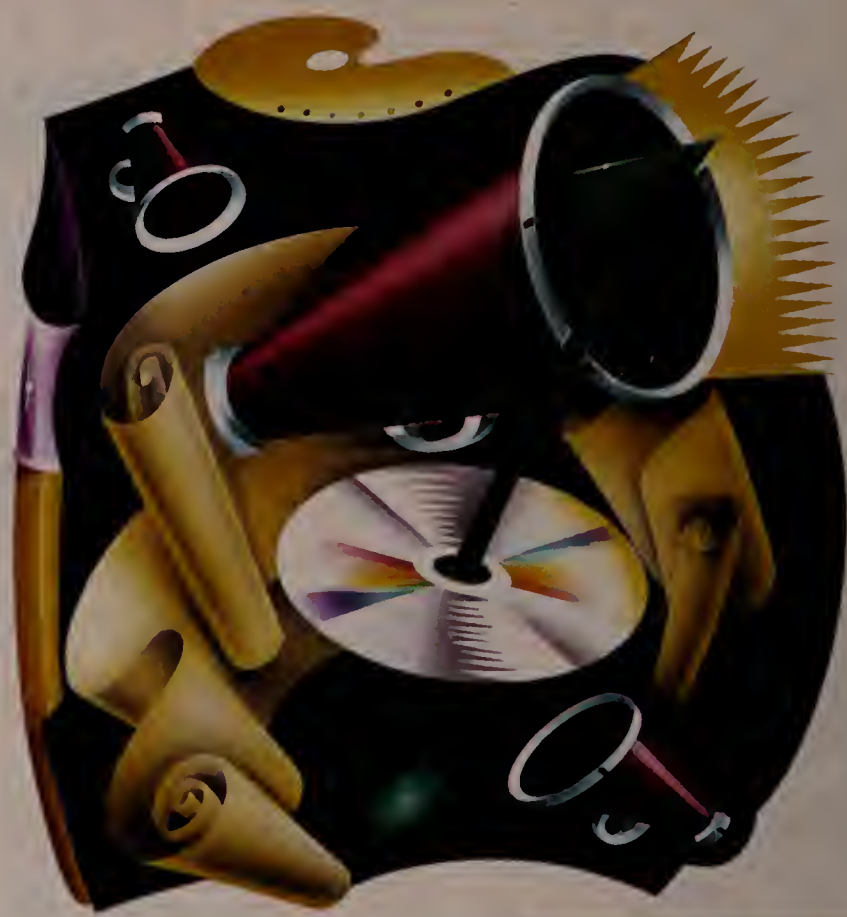

Whenever I hear the buzzword *multimedia*, my eyes glaze over. But I love what the technology does for me: seeing Beethoven's notes while hearing his music, annotating my *Excel* budget spreadsheet with voice messages, and having my Arnold WAV sound say "I'll be ba-a-a-ck" when I leave *Windows*.

Joining the ranks of multimedia users can be as easy—or difficult—as you choose. The easiest route is to buy a complete new preconfigured multimedia system with soundboard, speakers, and CD ROM player, and *Windows 3.1* already installed. Unfortunately, such systems cost more, and many use underpowered 386SX processors.

But if you already have a reasonably fast 386 or 486 home computer, it makes sense to buy your own multimedia upgrade kit that you'll be able to move to other PCs in the future. There is a dazzling array of upgrade kits that include the CD player, various combinations of CD software, sound cards, speakers, headphones, drivers, and cables. About the only thing missing is the technician to do the installation.

Bundles are a good idea: You can get valuable CD software titles, everything is designed to work together, and the price is usually lower than buying components separately. Media Vision, Creative Labs, and Media Resources, for example, offer plenty of high-quality configurations that start at around $550. But be sure to evaluate the components in these kits one by one. Don't let anyone, say, slip you a slow CD player by enticing you with good software.

Your CD player should have an average access time of at most 300ms (the lower the number, the better) with data throughput of at least 150 Kbps (the higher the number, the better). Check out NEC's Intersect CDR-74, which can increase throughput to 300 Kbps by spinning the CD twice as fast. Sustained throughput and fast access are essential for smooth animation in multimedia apps.

Even though you can get away with slower speeds for text-only CD functions such as reading files or accessing dictionaries, don't fall for the players advertised for $199. Most aren't multimedia compatible (limiting your software options), some use proprietary adapters, and they could be discontinued models. Realistically, expect to pay about $450 to $600 for a player bought separately. The CDR-74's street price, for example, is about $590.

Next up is a sound card. An 8-bit, 11-KHz sound card is fine for voice-annotating OLE-compatible apps, but if you want CD-quality audio, bump up to the Pro AudioSpectrum 16. Discounted to about $230, it offers a 16-bit stereo sampling at 44.1 KHz, audio ports, and a MIDI connector, and it serves as the SCSI connector for your CD player.

A hidden benefit of the newer SCSI sound cards is that you can use them to control a limited number of other SCSI devices you may add later. For example: About the time I was adding a CD player, my hard drive went on the fritz. Since my old sound card still worked but was unable to control a CD, I sought out a fast, stand-alone SCSI adapter. I discovered the Adaptec Host Adapter Kit and hooked up my CD player, a fast Conner 540MB SCSI drive, and a Tecmar QT-250es tape backup—all at the cost of just one slot.

Are your slots filled? Or would you like to use an external CD player on different machines? All the multimedia kit providers have external versions for about $100 more. But Trantor's MiniSCSI Plus lets you save a slot by hooking up SCSI devices to your standard parallel port. It'll generally be slower than internal adapters—especially when running motion video clips, which don't always play smoothly—but it installs in seconds, and you can hook up your printer to the same port. In typical file transfers you can expect adequate performance.

You can get some neat benefits from sound and video on your home PC. But if you and I ever meet, do me a favor: Don't call it multimedia.

Contributing Editor Steve Bass is president of Pasadena IBM Users Group. He can be reached on PC World Online (see page 8 for more information).

by Steve Bass

WHERE TO BUY

SCSIMaster Kit $367, Adaptec; 408/945-8600

Intersect CDR-74 $675, NEC Technologies; 708/860-9500

Creative Labs, 800/998-5227, 408/428-6600

Media Resources, 714/256-5048

MiniSCSI Plus $229, Trantor Systems; 800/872-6867, 510/770-1400

Pro Audio Spectrum 16 $349, Media Vision; 800/348-7116

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